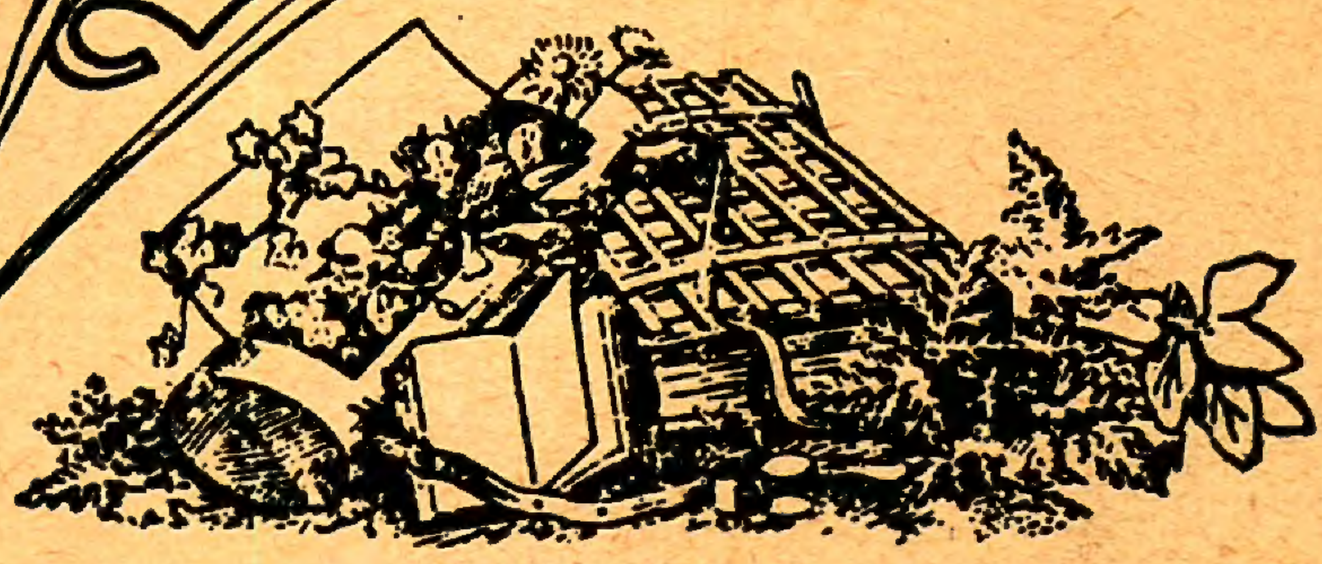
N.S. Vol. I January, 1952 No. 1

# The Gray Herbarium Bulletin



*Edited and published for*

**THE GRAY MEMORIAL BOTANICAL ASSOCIATION**

**and the**

**BOTANICAL GARDENS ASSOCIATION**

**OF THE UNIVERSITY OF MICHIGAN**

**by**

***Harley H. Bartlett and Rogers McVaugh***

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ANN ARBOR, MICHIGAN

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# HISTORY OF THE GRAY MEMORIAL BOTANICAL ASSOCIATION AND THE ASA GRAY BULLETIN

Harley H. Bartlett

## RETROSPECT AND PROSPECT

SOME of the botanists at or associated with the University of Michigan have recently become members of the Gray Memorial Botanical Association and have undertaken to revive the long-defunct Asa Gray Bulletin (1). As will appear, the University of Michigan has a special reason for commemorating Asa Gray, who assembled the beginnings of the University Library and was the first professor appointed to the University when it was refounded at Ann Arbor in 1837, the year in which Michigan became a State. Perhaps no other University ever commenced its activities by appointing a professor of botany, or even of the natural sciences! History shows (3, 4) that it was no accident, but resulted from a definite policy of the first Board of Regents.

Started as the Gray Memorial Chapter of the Agassiz Association, the Gray Memorial Botanical Association was one of two botanical "chapters". The other was the Linnaean Fern Chapter, which, through vicissitudes, gave rise to the American Fern Society, sponsor of the "Fern Bulletin" and then of the "Journal of the American Fern Society". The Gray Memorial Chapter was only very loosely affiliated, and long after the parental Agassiz Association had dwindled to a local society, it became an independent Association. It sponsored the "Asa Gray Bulletin" in the early years while it was still a "chapter". After losing control of this publication, because the organization was too small to support it by contributions or subscriptions, it issued (even though it did not technically "publish") another "Bulletin" (12) which still later was also known as the "Journal of the Gray Memorial Botanical Association" (13). The Asa Gray Bulletin was taken over by and merged into the "Plant World" which, in turn, became the "Journal of Ecology", sponsored by the Ecological Society of America.

Since the bibliographic record could hardly be more complicated than it already is, and since no other organization now has any interest in the name "Asa Gray Bulletin", the newly recruited Michigan members of the Gray Memorial Botanical Association are resuming publication of this long discontinued journal as the organ of the still existing organization which originally founded it and of another with allied interests, namely the Michigan Botanical Gardens Association, and all botanists, wherever they may be, whose botanical activities are closely related.

The writer of this historical sketch is conscious indeed that an adequate history of such an organization as the Gray Botanical Memorial Association would have to be largely biographical, dealing with the botanists who belonged to it and were helped by it to become effective amateurs or professional botanists. The present article, however, cannot take up this part of the subject, for it would grow altogether beyond bounds if even the most meager biographical data were included. It must now suffice to say that the early members of the Association were a notable company. If the revival of the Asa Gray Bulletin should meet with approval and sufficient support, this historical sketch will be supplemented in future numbers by a series of brief biographies of early members.

The traditional organization of the Gray Memorial Botanical Association provided for divisions, of which there were five, based at first only upon personal contacts and correspondence, although later they became somewhat geographic. Members who changed residence did not necessarily give up their original divisional affiliation, and new members were assigned by the Permanent Secretary to an "appropriate" division.

Pending possible reactivation of other divisions of the Gray Memorial Botanical Association, the restored Division C, that of the Great Lakes States (with the approval of the Permanent Secretary, Professor Lee Walp of Marietta College) is undertaking editorial sponsorship and business management of the revived Asa Gray Bulletin.

All members on the Association's roll of whose resignation there is no record have been asked to reaffirm membership, possibly on a modified basis, which will require a revision of the constitution. Many former members have been invited to join again, and others will be as soon as complete records become available. The final geographic Divisions were A, Northeast; B, Southeast, beginning with Maryland; C, Great Lakes; D, the Middle West; and E, the West. There had been much change, however, in their composition. Botanists with programs that would be furthered by coordinated activity in any particular area might well encourage the rejuvenation of these old Divisions, or propose others. Alaskan and Hawaiian Divisions might prove to be very successful.

It is too early to tell how many of the old members of the Gray Memorial Botanical Association will wish to support the revived journal. It is hoped to issue the second number of the Bulletin in April, containing lists of members of the two supporting associations and of the less definitely affiliated subscribers. Botanists who may wish to join either of the supporting organizations will be heartily welcomed.

Whether or not there will be enough interest to justify keeping up the old geographic divisions, it should be understood that the Asa Gray Bulletin is being re-established for all who wish to support it. In addition to those who will adhere in order to perpetuate the memory and influence of Asa Gray, its supporters will be mostly those interested in systematic, geographic and floristic botany, especially botanists whose activities center somewhat in Michigan.

Some anxiety has been expressed for fear that the revived "Asa Gray Bulletin" may become a nuisance, in these days of numerous and specialized scientific publications, by carrying stray articles of enough importance so that they could more appropriately be placed elsewhere. We shall try to carry on in the rather informal spirit of the original Asa Gray Bulletin, and also to publish much news of the subscribers, who will not be so numerous as to have no personal interest in one another's doings. There will be reports of experiences and observations which will be interesting within the group even if not scientifically important. These will include accounts of past or current botanical excursions, expeditions, and field research programs. Biographical and bibliographical items will be numerous. Discussion of any botanical matters that should interest our subscribers will be included, but extremely technical and highly specialized articles are not wanted. Since we would hardly care to edit a publication that did not have some substantial content, it must be assumed that articles will appear that will have permanent reference value. If new scientific names should be proposed in them, precautions will be taken to conform with all of the reasonable suggestions that have been made to insure validity of publication. The Bulletin will be sent to a carefully chosen list of twenty-five leading botanical institutions. Since it will also be available by subscription, and authors' separates of articles will be provided for additional distribution, there would seem to be no need for worry about whether the Bulletin is or is not to be "scientific" or "learned". It will fill a place in botanical publication, for both professionals and amateurs, that is not at present occupied. We hope that it will be considered worth keeping in botanical libraries.

There need be no apology for a new group of members reviving the Asa Gray Bulletin mainly in behalf of botanists associated in some way, naturally or by adoption, with Michigan. It gives the Association a new stimulus to activity, and continues, even though for a time more locally than before, the traditions of the Association and of its old publication. There is no reason why the policy should not change to suit changing conditions, if other divisions will recruit their membership.

No editorial policy can possibly satisfy all. Those who want nothing unless it is ponderous should realize at the start that the new "Asa Gray Bulletin" is not for them. Any who will feel aggrieved if anything except personalia is included should shun it. Those who are allergic to systematics ("new" or "old") should keep away.

A group of the reconstituted Division C, with Dr. Rogers McVaugh as coordinator, will work toward the goal of preparing a new Flora of Michigan. So such things may appear as county check lists and reports on local distribution, boring some almost to extinction and delighting others. Maybe they can appear as separately paged "Supplements". If local flora contributions appear in excess, or anything else has apparently been given too much space, the subscribers may be sure that supplementary funds have been found somewhere for that special purpose, and that the extra pages are costing them nothing.

## MICHIGAN'S SPECIAL INTEREST IN COMMEMORATING ASA GRAY

The territorial law of August 26, 1817, which provided for the founding of the University of Michigan, provided that the governing board should have power to establish various "useful literary and scientific institutions," among them "botanical gardens". During the first twenty years in Detroit the struggling young institution was jointly conducted by the Presbyterian minister, Rev. John Monteith, and the Catholic Priest, Father Gabriel Richard, who held, between them, all of the professorships that Judge Woodward had conceived of as covering the whole of human knowledge. When the territory of Michigan entered upon statehood in 1837, and it was decided that Ann Arbor should become the site of the University, the first professor appointed to the reorganized institution was the great botanist, Asa Gray, then at the outset of his career. Although he never actually taught at Michigan, he made a journey to Ann Arbor to lay out the campus (11, 20) and was then sent to Europe to buy the first books for the University Library. (2) He is confidently believed, without certain evidence, to have designated the eastern half of the original forty-acre campus as the "Botanic Garden", and it is so indicated on a map (3, 19) published in 1854, only seventeen years after the removal of the University to Ann Arbor in 1837 and the visit of Gray. So far as we can discover no other college or university ever started operations by the appointment of a botanist, as such, and his successors in botany at Michigan were proud that his career at Harvard placed him in the forefront of all American botanists.

As our first professor after the complete reorganization of 1837, and as the founder of our University Library, we at Michigan hold Asa Gray in a special place of honor. When Rogers McVaugh and the writer first thought of starting an informal botanical journal to contain short articles, to record passing events, and to take the place of personal correspondence among those whose botanical activities were more or less centered at Michigan, we quite naturally thought of the long discontinued Asa Gray Bulletin, which had many of the characteristics and objectives that we desired, and decided to revive it.

Before doing so, we looked into the history of the Asa Gray Bulletin and of the organization that sponsored it, namely, the Gray Memorial Botanical Association, and this article is the result. We wished to be sure not only that we could carry on reasonably in accord with the spirit of this organization, which had inspired unusual loyalty in its more devoted members, but also, if possible, that we could actually find and follow a thread of continuity from the past to the present. It turned out that the Association still existed, although greatly reduced, and could be restored to activity. Its history was a long and creditable one.

## FOUNDING OF THE GRAY MEMORIAL CHAPTER OF THE AGASSIZ ASSOCIATION IN 1887

After the death of Asa Gray in 1887 at the end of the most distinguished career of any American botanist, a group said to have consisted at first of about forty of his younger admirers and correspondents organized themselves as "The Gray Memorial Chapter of the Agassiz Association". Most of them were botanical amateurs and younger men who eventually became professional botanists. They pledged themselves to help one another in botanical pursuits by the stimulus of uninterrupted correspondence. Each member was to make a quarterly written report of his botanical activities, which was to be sent to the Secretary. The latter sent the assembled reports of each quarter on a circuit of the members. There was only one copy, and first-class postage was a burdensome expense to the members, so illustrations were not circulated with the reports but were available for examination by request of individual members to the Permanent Secretary. There is a statement by an early editor, after printing of the correspondence had been begun, that some of the reports were beautifully illustrated.

According to published reminiscences of O. A. Farwell (9, 10) the Gray Memorial Botanical Chapter of the Agassiz Association "was organized in December 1887, and the leading spirit was G. H. Hicks, who became its first president". Final details of the establishment of the Chapter seem to have been settled in May, 1888.

There are still elderly persons who have fond recollections of membership in the Agassiz Association. It carried on the teaching and research traditions of the great Swiss-American naturalist Louis Agassiz, and promoted interest in all fields of natural history, especially among young people and those older persons who were willing to supervise and guide them. It consisted of "chapters" which to a certain extent defined their own special objectives. Since personal friendship and mutual helpfulness among members were emphasized, those chapters which were too large were subdivided. Each unit, whether chapter or division, appears to have ideally consisted of ten members, and was responsible for recruiting its own membership.

The personal contacts and interests of the initial and other early members of the Gray Memorial Chapter had already established certain groupings, which eventually became five Divisions, designated by letters from A to E. These were at first not geographic, but predominating interests of the more active members in regional floras brought about gradual change to a more or less areal classification. Division A became the Northeastern Division; B, the Southeastern; C, the Great Lakes; D, the Midwestern; and E, the West Coast. Each Division had its own Secretary, and the Permanent Secretary acted as an over-all coordinator, so that the change from one President to another would not interrupt continuity of effort of the organization.

Useful and active as the Agassiz Association was in its prime, it eventually dwindled until nothing remained of it except the name, attached to a local club, and the Asa Gray Memorial Botanical Chapter. It had had an official publication, The Swiss Cross (21) which carried such notices as the initial announcement of the Asa Gray Chapter. Later the Chapter had temporary affiliation with two "official organs," for notices of general interest which required wider publicity than the correspondence circuit provided. These were "The Ornithologist and Botanist" (15) and "The Observer" (14). Botanists have forgotten them, but of the first we find a record that because of its connection with the Asa Gray Chapter, the library of Columbia University was attempting to complete its file. Later on it appears that even after the Chapter had founded the Asa Gray Bulletin as its own publication, some of the members did not care for it and favored a return to the "Observer".

## THE DIFFICULTY OF CIRCULATING MEMBERS' REPORTS, AND OF GETTING THEM WRITTEN

Several difficulties were inherent in the circuit system of communication among members. The reports were so heavy so that mere payment of postage was a burden. Each member received a package of circulating reports several times a year, and had to send them on to the next in the circuit within a week in order for the circulation to be accomplished within a year. If he wished to copy a report or part of one for future reference it had to be done sometimes at a most inconvenient time. Delays and losses were frequent. Farwell(10) tells this incident:

> "The Bulletin was established because of the discontent in the length of time it took to circulate the Reports. I remember that when at Ypsilanti I had an occasion to go to Ann Arbor and took with me a large bundle of reports in order to save the postage. I dropped the package in the mail opening in the residential door at the proper address, but discovered at once, when too late, that the house was vacant! It was several months before the reports got back in circulation."

It seems that there was considerable copying of reports, so that the circuit system demanded much time as well as postage. The time consumed during circulation limited the number who could maintain membership, unless some were to receive very stale reports. It became customary for members to resign when they found the requirement of making quarterly reports too onerous. Actually, excuses were accepted within reason instead of reports, but many members were too conscious of their obligations to take advantage of the provision for excuses except for real emergencies, and so resigned. The Secretary and the faithful few seem to have accepted resignations with truly Spartan fortitude, even though the fluctuation in membership threatened the existence of the organization. The Secretary had been instructed that it had been "decided best to make it a rule to drop from the list of those receiving reports all who do not send either report or excuse each quarter, said member to remain 'dropped' until heard from."

Permanent Secretary for over twenty years, Professor Charles C. Plitt of Baltimore, wrote an interesting historical sketch (22) of the Association. He was succeeded by Professor John B. Egerton of Loyola College, Baltimore. In 1939 the latter, who seems to have been continuously a member almost from the beginning, wrote of the founding members: "We, the present-day members, are their successors in an unbroken line since the summer of 1887. Though

the Association was never large and members lived mostly in distantly removed parts of the United States, we have held together with practically the same objectives from the beginning. Such an organization must contain some vital principle worth study or it would have become disorganized long ago. The charm seems to lie in the personal nature of the contributions. A report of one's own finding — a personal letter as it were — to all of the fellow members, has an appeal that most formal contributions lack, and such mutual correspondence has, perhaps, been the force that has held us together all these years."(8) After quoting from the call for members that appeared in the "Swiss Cross" for May, 1888 ("The object of the society is mutual assistance in the study of botany by means of correspondence and the exchange of specimens ...Each member makes a quarterly report of his botanical studies.") he goes on to say: "In 1893 Mr. C. L. Shear was President and the circulation of reports was then very unsatisfactory. It was believed that the time had come for printed reports."

There was no little difference of opinion about the desirability of a publication. On one side were those who wished to reserve for their reports almost the status of personal letters, quickly dashed off, and, even if not confidential, so closely confined to a narrow circle of friends that scientific short-comings or lack of literary quality caused no embarrassment. On the other side were those who had legitimate and commendable ambition for botanical authorship and wanted their contributions to reach a wider audience. They had the strong argument that printing the reports would solve the circulation difficulties of the round-robin system of correspondence.

A perennial tribulation of the Association was the difficulty of one secretary (or editor) after another in prodding procrastinating members into writing reports at all. Those who favored a journal instead of a correspondence circuit admitted that the acceptance of contributions from outside the membership would help sustain the activity of the organization without putting so much pressure on the individual members. There were always those who liked to receive and read the reports but could not or would not bring themselves to write them.

## THE ASA GRAY BULLETIN, 1893 - 1900

Cornelius Lott Shear, as President of the Chapter, and Miss C. G. DuBois, as General Secretary and Editor, took the initiative in founding the proposed publication. The initial number appeared as the "Bulletin of the Gray Memorial Chapter of the Agassiz Association." The title was changed to the "Asa Gray Bulletin" in subsequent numbers (1). The first number contained

reports of Divisions A and B for the second quarter of 1893. President Shear's editorial stated that most of the fifty odd members had failed to pay their dues of $2.00 and that only $23.45 remained in the treasury. The cost of printing the second number would be $24.00. He urged that the dues should not be viewed in the light of a journal subscription, for the small membership in the chapter and irregular publication (not entitling the "Bulletin" to second-class mail rates) would keep costs relatively high. There was no expectation of great help through subscriptions from outside the "Chapter". The Bulletin, he wrote, would be unique in that it would encourage the beginning botanist to record his observations. "An earnest spirit of truth-seeking was all that the venerated Asa Gray required in the young student to whom he lent his aid. Let us continue worthy of our name as a Chapter, even if our organ takes no place in the crowded lists of regular publications."

It will be seen that Shear and Miss DuBois followed the wishes of the conservatives in not pushing the new Asa Gray Bulletin into competition with the more conventional botanical journals for subscribers or scientific contributions. By the time the second number appeared the list of the officers and executive council included two Michigan botanists, G. H. Hicks and C. F. Wheeler, then both at the Michigan Agricultural College. The third number announced that the efforts of President Shear had resulted in the attainment of a paid-up membership of forty-four, in five divisions, of which Division C included the Michigan members. This division kept those Michigan botanists who moved away from the state, although there was provision for transfer of chapter affiliation if members wished. In the first printed list Ann Arbor had three members, East Lansing two, of whom one, G. H. Hicks, had already removed to Washington, and Alma two, one of whom, Charles A. Davis, later removed to Ann Arbor.

In the beginning the objectives of the Asa Gray Bulletin were to carry on the commemorative traditions of the Chapter, and to supply printed reports of members as a replacement of the former correspondence circuit. Regular publication, however, could only go on if material came regularly to the editors. In the second year of the Bulletin it became clear that many members were unwilling to write for publication. The reports received were so few in comparison with the number expected that less than half a dozen were on hand as an editorial reserve. (Some few members, however, appear to have transferred their support to a more agressive journal.) The suggestion had been made that connection with the Agassiz Association be severed, to prevent loss of members who would willingly subscribe to the Bulletin but could not be counted upon to contribute reports, and that subscriptions to the Bulletin

be invited from anyone. It seems that the too onerous requirement of regular report writing was unchangeable so long as the organization was a Chapter of the Agassiz Association. Because of sentimental attachment to the Agassiz Association, Plitt wrote, some of the members "disliked to sever the thread that still linked us with the old movement." A rift was all too apparent between those who wanted to maintain the traditional character of the Chapter and those who had now become more interested in making a success of the Bulletin, and considered that objective more important than trying to please the reactionaries.

Mr. Farwell in his historical account (10) mentioned the early days of the round-robin circuit and went on to say: "Then came the Asa Gray Bulletin in 1893 to 1897, when the chapter and the Asa Gray Bulletin separated (the latter continuing on to 1900, to be merged with the Plant World). The former returned to the old correspondence circuit.

"About this time Mr. Hicks took over the Bulletin and took it to Washington where it was published. Several who promised him support forsook him and started or joined with a rival magazine which did him much damage and possibly prevented the financial success of the A. G. Bulletin. Our Bulletin died from lack of material, not from lack of finances." According to Mr. Farwell the subscription to the Asa Gray Bulletin became part of the dues, but the Bulletin ceased to be the Chapter organ. As a result, many of the members resigned. He went on to say:

"There was some talk and consideration of disorganizing and abandoning the Chapter. Membership had been forty-nine in 1892, and was as low as thirteen or fourteen in 1899. The chapter was divided into divisions from "A" to "E", and ten members completed a Division. In 1898 we had only Divisions A and B. C was again revived in 1900. In 1902 there were only two members in Division B, Miss Keys and Mr. Graves."

"Division C was revived and I became its only member at the beginning of 1900. Two or three other members were soon added, and I resigned from the Division Secretaryship and from the Chapter in October 1900, because of the pressure of other interests."

With the beginning of the fourth volume of the Asa Gray Bulletin, a change of general policy was made. The subscription rate was reduced to 75¢ a year, and support was asked from "every botanical student in the United States." An effort was made to get 500 new subscribers. Reports from members of the Gray Memorial Botanical Chapter of the Agassiz Association were no longer depended upon by the editor, but even more than before the distinctively informal character of the Bulletin was to be maintained by

the publication of questions and answers and of correspondence which might lead to exchange of personal observations among its readers. Chapter members who before had been automatically dropped for failure to make reports, and whose financial support for the Bulletin had thus been lost, could now subscribe without any obligation to write. With expansion of circulation there was a promise of articles from Dr. Erwin F. Smith, one of the most honored botanical alumni of the University of Michigan, and a series on seeds and germination, reflecting the new activities of Mr. G. H. Hicks, who had gone to the U. S. Department of Agriculture from an instructorship at the Michigan Agricultural College.

Farwell (9) wrote: "Miss DuBois, as General Secretary and Editor of the Asa Gray Bulletin [through Vol. V no. 2, March 1897], worked unsparingly and untiringly in the face of great difficulties and discouraging conditions and general lack of support and help that she should have had...She reluctantly tendered me her resignation in December 1898 because she was devoting her entire time to writing fiction and had no more time for botany. She severed the old ties with many regrets. The records of the General Secretary, amounting to hundreds of pounds, were turned over to her successor in office, Mr. W. N. McDonald."

The first two numbers of Volume V of the Asa Gray Bulletin were published from East Lansing, Michigan, where the business management was to have been assumed by W. R. Kedzie, although Miss DuBois retained the editorship. The following number appeared from Washington, D. C., and Lyster H. Dewey was announced as Business Editor. The Bulletin was to be popularized and appeared with a new cover designed by F. A. Walpole, Artist of the U. S. Department of Agriculture, depicting a spray of Carex Grayi, which, with the title, would "serve as perpetual reminders of one who did inestimable service for American botany." (The Walpole design is used for the cover of this first number of the new series.) Gilbert H. Hicks became Editor-in-Chief. Illustrations were published.

Vol. VII showed another turnover in the affairs of the Bulletin. Thomas A. Williams and C. L. Shear became joint editors following the sudden death of Mr. Hicks, and the place of publication became Takoma Park, D. C. The first number contained this notice: "To the Gray Memorial Botanical Chapter of the Agassiz Association. The Bulletin welcomes you to the use of its columns for chapter notices and will be glad to publish such papers as come within its scope." A long time had elapsed since the Bulletin had had any news of the Chapter! The first number of the next volume contained a list of the officers of the Gray Memorial Botanical Chapter

with the news that the latter was issuing a correspondence Bulletin each month except in August and September! It also forecast the discontinuance of the Asa Gray Bulletin in the announcement that a new journal of popular botany had been started under the auspices of Dr. D. T. MacDougal, director of the laboratories of the New York Botanical Garden.

In December 1900 the joint editor, Thomas A. Williams, died suddenly. Shear, his associate, brought out the final number of the Bulletin, Vol. VIII No. 6, with an editorial stating: "The publication of the Bulletin closes with this number. By an agreement between its stockholders and the publishers of the Plant World the journal passes into their possession. All unexpired subscriptions and advertising contracts will be filled by that journal. The Plant World will be enlarged by four pages which will be devoted to cryptogamic botany under the direction of the writer." Thus ended the original series of the Asa Gray Bulletin in January 1901. It had had a troubled but very useful life. Dr. C. L. Shear had been editorially active at the very beginning and again at the end, but others had carried the editorial burden in the years between.

## THE RETURN TO NON-PUBLISHED COMMUNICATIONS, 1898 TO 1934 AND SEVERANCE OF TIES WITH THE AGASSIZ ASSOCIATION

The conservative wing of the Gray Memorial Chapter, disgruntled by losing control of the Asa Gray Bulletin, which, as we have seen, occurred in 1897, resumed the old correspondence circuit, and seem to have carried it on until 1934, through the efforts of Professor Charles C. Plitt of Baltimore, who was General Secretary from 1909 until 1930. He was succeeded by Professor John B. Egerton, who wrote (6) in 1938:

> "As Permanent Secretary I am the custodian of these old documents....There is wrapped up in these old files the history of the Association as well as the outpourings, one might say, of the life blood of our old and cherished members. Those prior to 1910 have apparently been destroyed, but most of those after that date are to found in the papers turned over to me after Dr. Plitt's death, and may be consulted by members interested."

His reference to the "Association" indicates the change of name of the organization which did not occur until long after the Agassiz Association, except for this one surviving Chapter, had surely sunk into its last slumber. A new constitution was adopted in 1899

and revised in 1930 during the presidency of Mrs. Oliver Kamm, Grosse Pointe, Michigan, when the Gray Memorial Botanical Chapter of the Agassiz Association became the Gray Memorial Botanical Association.

On a later occasion Permanent Secretary Egerton (7) wrote:

> "Quite flattering, indeed, and something that should make us "sit up and take notice" is the mention of many of our earlier members, given in the current issues of the American Botanist, who have become well known botanists. A suggestion is there made that those now living be looked up and made honorary members. The suggestion has been made several times before: it is a good one and should be acted on. G. M. B. A. has a history of which it (WE) should be very proud: it is, I believe the oldest nation-wide botanical society in America with a continuous history and an active membership, though at no time very large, from the day it was founded to the present day. The first general list of members contained 42 names, and their addresses ranged from Maine to Texas and from the Atlantic to the Pacific. At that time we had three Honorary Members or Advisors in addition to the regular 42. They were: Professor E. L. Greene...for the West Coast, Professor W. M. Canby and Professor W. W. Bailey...for the East...Why not revive the list of Honorary Members and in all things hold to the Noble Heritage that has been handed down to us?"

## THE BULLETIN OF THE GRAY MEMORIAL BOTANICAL ASSOCIATION, 1934 TO 1939

For about thirty-six years following the Chapter's divorce from the Asa Gray Bulletin, the circulation of unpublished reports continued. As late as November 1934 the old requirement of regular reports or "excuses" was still in effect, though likely not to be observed. Egerton, the Permanent Secretary, wrote: "Several members have written that pressure of various duties makes it hard for them to contribute regularly to the Bulletin, yet they do not wish to resign from the 'Association'. To all such I have replied....'Do the best you can....a brief note is better than nothing'."

We learn from the President's "Message" for 1934 that:

"In 1933, during the presidency of H. A. Rankin, Fayetteville, N.C., the Association had voted for another change in the circulation

of our bulletins. Mr. Charles C. Plitt of Baltimore, Md., suggested that his "Division C" would make a "Trial Bulletin for Keeps." At this time Mr. Plitt was our Permanent Secretary of G. M. B. A. President Rankin was the Editor."

There is a statement that the Bulletin "for keeps" as sponsored by Mr. Plitt actually appeared in October 1933, but no copy of it has been seen. After Mr. Plitt's death, there was another brief period of round-robin circulation, but publication of the "Bulletin" (12) was resumed in November 1934. In the number for that date President Elizabeth Downhour of Indianapolis reported:

"Beginning this fall of 1934 we...will subscribe for the American Botanist, and will receive four issues for the year: Oct., Jan., April and July. The intervening months will be supplied by G. M. B. A. Bulletins, made up by the articles written by our members and sent to Mr. Rankin." The Association was to have two pages of each issue of the American Botanist for its use.

The Permanent Secretary, John B. Egerton, commented that the Bulletins which had not been "for keeps", had all gone their rounds by the middle of July, and that the change would put the Association on a more solid basis than it had been for many a year. He wrote: "Though not as large in membership as might be desirable, the Association is well organized and has a worthy aim, — an aim that must eventually appeal to many. Cooperation with the American Botanist will help us much in this. We know how much it has done to brighten the lives of those who have come under its influence and from all prospects it now seems to be heading straight on to do more in the future, — a real help to its members and a worthy memorial to the great man whose name it bears."

The "Bulletin" was a bibliographical curiosity. The members of the G. M. B. A. had been instructed to prepare their copy just as it was to appear, in handwriting with purple "hektograph" ink or with typewriter, using hektograph transfer paper, which was provided by the editor. The copy was then assembled by the editor, who numbered the pages and hektographed as many copies of the "Bulletin" as were required by the members. Only three or four extra copies were needed, for it went to the "American Botanist" and two libraries. In the course of years the purple hektograph ink has faded, not so much on the inner pages as on the covers, which, if they have been exposed to light, have become almost illegible. The Bulletin appeared as a mixture of handwriting with all degrees of bad typing. Each number had its own pagination, and the volumes were not indicated on the cover titles until Vol. V, No. 1 appeared, in October 1937. This concession to bibliographic propriety marked the semi-centennial of the organization. Editor H. A. Rankin wrote (16):

"The New Series [had its] beginning with October 1933, the first issue of the Bulletin in its present form.

"The Bulletin has been issued, or perhaps we should say circulated, in some form for the past 50 years.

"The Bulletin is, and has always been, intended for circulation only among members of the Association. However, for the past year or two it has been mailed regularly to the American Botanist, and also, by request, to two botanical libraries." [These were the libraries of the Brooklyn Botanic Garden and the Department of Botany of the University of North Carolina.]

"While we are glad that a few files of the Bulletin will be preserved, so that anything of scientific value or general interest may possibly find its way into other channels, the Bulletin is, as it has always been for so many years, simply a meeting place where members of the association may discuss or discourse on things which are of interest to them, and may tell among themselves their botanical tales, and we feel that no member of the Association has other aspirations for the Bulletin."

The following number was a fiftieth anniversary number in commemoration of Asa Gray. Mr. Rankin wrote (17): "Our Association is now in its 50th year. It has never had a large membership, probably never more than 50 or 60 at one time. It has numbered during the years many prominent botanists among its members... Probably a majority of our members, however, have been amateurs, many with little or no botanical training, but with some enthusiasm for things botanical. Probably the Association owes its existence in part to the combination of these two, — the trained and untrained. If all had been professional it would have become strictly scientific and have had to compete with other such organizations. If all were amateurs it would not have had the proper botanical background and have soon been up a blind alley. So...here in our Association professional and amateur, North, South, East and West, meet with a common interest and enthusiasm, and here lasting friendships are formed...There is a place for it. Let us hope that others may see this, that it may grow and live to celebrate many more semicentennial anniversaries."

In the following number Mr. Rankin emphasized the long continuity of the chief objective of the Association, which was to give every member an opportunity to report his activities to all the rest. He wrote (17):

"The Bulletin is not just another botanical magazine to be paid for. It is the only activity and the official means of carrying out the purposes of the Association. It is made up of articles, letters, or reports, which, under the rules, each member is under the

same obligation to send in monthly, or, to put it another way, each member has the same privilege of sending in. The ideal Bulletin would be one with the name of every member in the table of Contents. It might be a lot of work for the editor, but we would like to try it once."

## THE JOURNAL OF THE GRAY MEMORIAL BOTANICAL ASSOCIATION, 1939 - 1943

In 1939, a group of about 25 students from Marietta College, under the leadership of Professors H. R. Eggleston and R. Lee Walp, visited with Mr. Rankin in North Carolina and were accompanied by him on a field trip. The result was an infusion of new zeal into the Association, and the taking over of publication of the Bulletin by the Biology Department of Marietta College. Mr. Rankin remained Editor, but the following volume, greatly improved in neatness and legibility, mimeographed instead of hektographed, and with a cover bearing a portrait of Gray, marked a new lease on life for the Association. The portrait was drawn by Miss Betty Story, staff artist for the Field Museum, and was used continuously until cessation of publication. With volume VII the Bulletin also acquired a new title, becoming on the cover but not on the actual title page of each issue the "Journal of the Gray Memorial Botanical Association, Founded 1887." (12)

## INACTIVITY, 1943 - 1951

Publication ceased during the war. The last number in the only set of the Bulletin seen by the present writer (that of the late Mr. O. A. Farwell, now in the Library of the Cranbrook Institute of Science) is Vol. XI, No. 1, for November, 1943. Since then there has been only irregular correspondence among the remaining members.

Although the Association has slumbered since 1943, a nucleus of the old membership remains. Since there has not been time to contact all of the members to find out what wishes they may have for the future, it has been decided, in order to renew activity, that Division C, that of the Great Lakes, with newly recruited membership, will sponsor, jointly with the Michigan Botanical Gardens Association, the renewed publication of the "Asa Gray Bulletin". Since this will likewise replace the "Bulletin" (later the "Journal") of the Gray Memorial Botanical Association, which ran into an eleventh volume, it seems best to start the New Series with Vol. I, No. 1. If members should show no interest in retaining the geographical divisions, these may later be merged into an undivided Association.

In order to avoid mistakes of the past there will be little objection, it is believed, to changing the rules so as to require no regular reports for publication. That requirement has more than once almost brought about the demise of the Association. When writing and publication for themselves only had become the sole activity of the Association, and then voluntary writing by members practically ceased, the burden put upon the editor was obviously too great. Normal living was so thoroughly disrupted during the war that it is perhaps not to be wondered at that the G. M. B. A. became inactive. The constitution should be changed so that, in the future, members will be encouraged to write, but so that it will suffice if they subscribe. The Bulletin cannot be published regularly unless letters and news come in regularly. It is hoped that the new series may be a quarterly, but regular publication is not promised. If the past has taught anything, it is that the supporters of the publication must inevitably be a larger group than those who regularly write for it. So the editors of the revived Asa Gray Bulletin welcome contributions, but hope that it may appeal to readers as well as writers! A new affiliation with another organization of kindred objectives may help to stabilize it, and it will also need subscribers who do not belong to either supporting Association.

## THE MICHIGAN BOTANICAL GARDENS ASSOCIATION

In 1925 the Regents of the University of Michigan authorized the organization of the Michigan Botanical Gardens Association. This was to have no dues or other requirements for membership except a practical interest in the objectives of the Gardens, as demonstrated by gifts, participation in collecting activities, etc. Unfortunately no publications or reports of progress (except letters to individuals) have been sent to the members, and some friends of the Gardens may not even know that they have been considered members. Such an organization can only function properly if it has a publication. Since there are no dues in the Botanical Gardens Association, it is proposed to ask the members to subscribe to the Asa Gray Bulletin, but there can be no obligation that they should do so. It is anticipated that enough subscriptions will come from them to justify reporting in the Bulletin on the progress and current activities of the Gardens.

The Botanical Gardens had a collecting expedition in Mexico in 1934 which was partially financed by a few cash contributions that had been received up to that time, and this activity was duly recorded in the Michigan Alumnus (2, 3) and in the historical account of the Michigan Botanical Gardens which was published in the Encyclopedic Survey of the University of Michigan (5). There

have been a good many expeditions subsequently which have had no published record, although the friends of the Gardens are always interested in knowing what is going on in the way of botanical exploration. It is planned that information about excursions and expeditions will be a regular feature of the Asa Gray Bulletin.

Through the cooperation of the Gray Botanical Memorial Association, the Michigan Botanical Gardens Association, and of individual subscribers interested in general floristic, geographic, and systematic botany, there ought to be sufficient support for the Asa Gray Bulletin without appealing to any who will not have the friendly and personal interest in one another that characterized the old Gray Memorial Botanical Chapter of the Agassiz Association. In order to encourage informal correspondence among all of its readers, the April number of the Bulletin will contain membership lists of the two Associations, and a third list of other subscribers, who will all have a cordial standing invitation to join either or both of the supporting organizations.

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Contains: List of Officers; Constitution; historical sketch, "The Gray Memorial Botanical Association", by Charles C. Plitt; List of Members. From this publication it is learned that the Divisions in 1931 were: A, New England; B, New York and New England; C, Southeast; D, Section I, North Central States, Section II, California; E, Central States. (This pamphlet was not known about by the Editors in time for Mr. Plitt's sketch to be reprinted instead of writing much of the foregoing article.)

## DISCUSSION OF POLICIES IN A LETTER FROM MISS EMMA E. LAUGHLIN, TREASURER OF THE GRAY MEMORIAL BOTANICAL ASSOCIATION, 1910 to 1936

Miss Emma E. Laughlin of Barnesville, Ohio, who was Treasurer of the G. M. B. A. for more than twenty-five years, has written a letter which she does not release for publication as a whole, although she says to use such parts as we wish. In it she discusses matters of policy which had already been dealt with (as well as a new member could) in writing the historical article that precedes this group of letters.

Miss Laughlin states that during the "round-robin" period following the old Asa Gray Bulletin but before mimeographing of the later "Bulletin" was begun, "the articles had been chatty and personal — about anything the writer was interested in at the time, and with comments on other articles. The new method destroyed the personal element, and most of the older members dropped out." (Miss Laughlin herself, however, remained a member.)

In the revived Asa Gray Bulletin it is hoped to retain the personal element by the free publication of letters, which may be as newsy and informal as the writers wish. It must be expected, however, that there will be articles of all degrees of formality, and, of course, it can not to be expected that all of them will interest each and every subscriber. A plan is being considered of taking care of related but longer and generally "unreadable" contributions, such as local flora lists, by the publication of separately paged supplements, which the readers of the regular "Bulletin" need not subscribe to at all, or feel any obligation to help pay for. Miss Laughlin, as older members will remember, had published two installments of her "Flora of Barnesville, Ohio, and Vicinity" in the mimeographed "Bulletin of the Gray Memorial Botanical Association" when publication of the latter was discontinued in 1943. Her "Flora" remained unfinished. Such material as that, valuable for the record but not considered lively reading except by a very few, could be taken care of in the supplements.

Miss Laughlin alludes to the ever-widening gulf between old-fashioned amateur botanists and the professionals in those newer fields of botany which require elaborate equipment and the utilization of difficult techniques. This is inevitable, but for those in the cluster of old and new fields allied to systematics there is a bridge across the gulf which is not as much used as formerly although it remains permanently open to traffic! One of the laments of teachers of botany is that they succeed so poorly in recruiting the ranks of

amateur botanists. Some of us think that if the more deeply interested college students who leave our classes could be kept reading something botanical and could be induced to keep up botanical contacts, they would eventually undertake useful amateur investigations or recreational activities in field, garden, or library.

Extracts from Miss Laughlin's letter follow:

Barnesville, Ohio, Jan. 13, 1952

Dear Mr. Bartlett:

. . . .I was a member of the Gray Memorial Botanical Chapter for many years, and was treasurer for over twenty-five years. . . . . The chapter was divided into divisions of about ten members each. I do not remember that locality had anything to do with the divisions.

There was a president, a general secretary and a treasurer. Each division had a secretary. The division secretary wrote an article and started the bulletin through the division. Each member wrote an article and sent the bulletin on to the next on the list. When it reached the last, that person started it back through the division to the secretary, who then sent it to the secretary of the next division, and it went through but not back. . . .and so on until it had reached every member, when it was sent to the general secretary to be kept. The members were to keep the bulletin not over three days, but sometimes a member would keep it too long, and that spoiled the system. . . .

Another thing was that some of the newer members were not amateur botanists, and wrote very technical articles, which were not interesting to the older members.

A former very enthusiastic member, Miss Pauline Kaufman, of New York, in her will left $100 to the Chapter. . . .I always have felt that that money should be spent for something permanent in memory of Miss Kaufman, and not for general expenses. . . .

I have kept in touch with only two of the older members, — Mrs. H. E. Wilder, of Charlotta, California, and Mrs. Oliver Kamm, of 365 Lakeshore Drive, Grosse Pointe Farms 30, Michigan.

I am eighty-five years old and cannot visit the many rare plant stations I know about. . . .

Yours sincerely,

Emma E. Laughlin

## SHOULD THE DIVISIONS OF THE GRAY MEMORIAL BOTANICAL ASSOCIATION BE MAINTAINED?

ADDITION of many new members to Division C, in view of the present numerical weakness of the other divisions, raises the question whether it is worth while to keep up the divisions. Might not an undivided membership be preferable?

The constitution of the Association may be revised and amended at any time by a two-thirds vote of the members. With the next ballot for officers, which will be sent out by the Permanent Secretary before April first, there will be several proposals for change of the constitution, one of which will be the matter of giving up the Divisions.

Maintenance of the Divisions might stimulate recruiting of membership at several centers. Baltimore, for example, was the headquarters of G. M. B. A. for many years, and the tradition of strong membership there should certainly be maintained. Mr. Charles C. Plitt of Baltimore served as President in 1902 and 1903, and then as General Secretary from 1910 to 1931. He was likewise Secretary of Division C, the membership of which extended from Baltimore southward to North Carolina and westward to Ohio and Indiana, although many of the Great Lakes members were then in Division E. If there is any hope that keeping up the divisions would stimulate association of amateur and professional botanists by locality or special interest, then the Divisions should not be given up. It may be pointed out that the next General Secretary following Mr. Plitt was Professor John B. Egerton of Baltimore, and that he was followed by Mr. H. A. Rankin of Fayetteville, North Carolina, also a member of the Southeastern Division. Is there no one in the area from Maryland and Delaware southward to recruit the membership of what is now Division B? It might become a very useful group for regional research.

Although there will soon be a chance to vote on abandonment of divisions, action should not be too hasty, for they may still serve a useful purpose. It should be especially remembered that some divisions might well be organized on a non-regional basis. How about Divisions for special topics, such as grasses, weeds, natural hybrids, fossil plants, aboriginal uses of plants, botanical history, etc.? There is no reason why the same persons should not belong to both regional and topical divisions. — H. H. B.

## GREETINGS FROM LEE WALP, PERMANENT SECRETARY OF THE GRAY MEMORIAL BOTANICAL ASSOCIATION

THE PERMANENT SECRETARY, Professor R. Lee Walp, of Marietta College, Marietta, Ohio, is at Stanford University on leave of absence for the academic year 1951 - 52, as a Fellow of the Ford Foundation. Until he returns to Marietta he will not have access to the records of the Association, but it is believed that we have found the names and last recorded addresses of all members or past members who have been active as recently as 1936, and also a good many others, but by no means all who dropped out or became inactive before 1936. We have attempted to get in contact with nearly a hundred, some of whom may wish to renew membership. A few ask to be re-enrolled. Many are elderly, and have not replied. The return of not a few letters from the last known addresses indicates that a considerable number of former members have died or that they moved several years ago. It will be difficult to reach everyone, but all reasonable efforts will be made to do so by the Permanent Secretary and the editors of the Bulletin. Professor Walp writes:

Building 305, Apartment 1, Stanford Village, Calif.,
Jan. 8, 1952.

Dear Professor Bartlett:

Your plans for the Asa Gray Bulletin meet with my approval and I am certainly glad to hear of them. By enrolling new members in Division C and with the support of friends of the Michigan Botanical Gardens, the Gray Memorial Association will take on a new life. I never relished the idea of being responsible for its termination. I don't know how Mr. Rankin ever kept it going, — maybe he had more time than a college professor. . . . I shall be glad to continue as Permanent Secretary . . .

We spent Christmas vacation seeing Southern California and taking many kodachromes. I suppose I'll regret I didn't do any collecting, but that is difficult with one's family along. I spent three days at Pomona College attending the Western Naturalists meetings.

Happy New Year to our new adventure! I hope the Bulletin will go on at least another 50 years.

I am, yours,

Lee Walp

# GREETINGS TO THE NEW "ASA GRAY BULLETIN" FROM LIBERTY HYDE BAILEY, THE ONLY ONE OF US WHO KNEW ASA GRAY

Ithaca, N. Y., Jan. 14, 1952

Dear Mr. Bartlett:

It is good to have your letters about the reorganization of the Gray Memorial and Botanical Gardens Associations, and to include $2.00 for the bulletin you are to issue.

I suppose that there will be a new organization in two divisions when new correspondence develops, and where I shall be placed in those organizations as a final statement may well await further decision, but for the present I would naturally fall into the Great Lakes states. Botany is now so divided into its great divisions and Asa Gray is so long out of the picture that I suspect the number of botanists taking part in the reorganization you propose will not be very great. However, if only a relatively few continue their membership it will well be worth the while as an effort to bring back something of the solidarity of the old botanical field.

I am certainly in sympathy with the reorganization of the association and trust it may gain momentum as years go on. My memories of Asa Gray are indeed very keen and I can write a number of short notes that will tend to hold his memory green. For about two years I have been laid up with the effects of a broken hip and am not in shape to do much just at present but an item or two now and then may help. Perhaps within a few days I could send you a note as a starter. Situations here have changed radically and Dr. G. H. M. Lawrence is now at the head of the Bailey Hortorium. You should be in touch with him for he is an expert botanist.

I am particularly glad to hear from you and to keep in touch as best I can. I am now one of the very old remaining ones but my memories still are keen and interesting.

Cordially yours,

L. H. Bailey
per E. Z. B.

# TWO LETTERS FROM DR. CORNELIUS LOTT SHEAR, THE FOUNDER OF THE OLD "ASA GRAY BULLETIN" AND ITS LAST EDITOR

1707 North Sixth Street,
Monroe, Louisiana,
January 19, 1952.

Dear Mr. Bartlett:

I was surprised to receive your letter and to hear that you are going to try to revive the Asa Gray chapter and the Bulletin. The last I remember it was when the BULLETIN was combined with THE PLANT WORLD.

I joined the old correspondence Chapter in '87 or '88. It served a very useful purpose in encouraging the scattered students and amateur botanists, of whom I was one.

A number of these men, as you know, later became distinguished. Among those I remember offhand were: Dr. Jepson, Blasdale (still living, I think), Chestnut, Burtt-Davy, Holzinger, Hicks, Wheeler, "Peat" Davis, Farwell, Pieters, Dewey, Mrs. Lucy A. Osband (teacher of Botany at Ypsilanti Normal School); Miss Dubois, the first Secretary, who was a novelist.

I have been living here with my older daughter for the past year and a half, and have been in bed most of the time with heart trouble, so that I am unable to do any more Botanical work. But I am still interested, and I wish you success in this undertaking. . . .

Cordially yours,

Cornelius L. Shear.

January 28, 1952

Dear Mr. Bartlett:

Since sending in your questionnaire a few days ago I have looked up a few old records which I happened to have, and have found a few which might interest you.

I found a few records relating to the early history of the Association and the Gray Chapter which may be of interest to you if you do not happen to have them.

I joined the Association in '88 I think, and the Gray Chapter in '89. I have a list of the members of the Chapter as of 1890. It lists 45 regular members and three honorary members. So far as I know there is only one other living member, W. T. Swingle. He may possibly have been a Charter member.

There may be some of this history in the first volume of the Bulletin — I do not remember — my set was disposed of with my library some years ago. Swingle may be able to give you some information which you and I do not have.

G. H. Hicks in his Presidential address to the Chapter in May, 1890, says, "The Chapter was founded 2 1/2 years ago." If you do not have a copy of this, or the other papers I have, I shall be glad to loan them to you.

As you know, the Bulletin was merged with The Plant World in 1901. I did not know the Chapter had been continued since then.

I am enclosing a copy of a statement in regard to the Association, of which I happen to have a duplicate. It has a good picture of Agassiz. I have a copy of the program of the convention of the Association meeting in New York City Feb. 27 — March 1, 1890, which I attended. I met the President, Professor Ballard, and many distinguished scientists who addressed the meetings.

I hope you will publish a good account of the early history of the organization, as it is worthy of permanent record.

Sincerely yours,

Cornelius L. Shear.

## BEST WISHES (AND ALSO SCOLDINGS) FROM BRADLEY MOORE DAVIS

2814 S. W. Labbe Ave., Portland 1, Oregon
October 31, 1951

Dear Harley:

I am sending $10 to Dr. Ruth McVaugh to help start your project, and my best wishes for its success. It will give you something new to push further back the things that you ought to do.

Cleland has asked me for such information as I have on the presence of Oenothera Lamarckiana in the North West. I told him of your Suksdorf record which seems to be the best authenticated, although I dare say others have introduced it into their gardens. English folk in Victoria and Vancouver are quite likely to have done

so, since gardening with them is more than a hobby, — it is an obsession.

Why won't you brace up and publish the Suksdorf account.* It should not take much time or effort, or do you find pleasure in giving yourself pity? I do not think you will get much sympathy from your friends.

We jog along pleasantly but I am less and less active as the months pass. The development and care of the property takes about all of my time and strength, and family affairs, in these difficult times, require the best attention that I can give.

Grandson No. 3 appeared last summer, — a strong boy and alert. Poor little fellow must carry the name Bradley Hunt, but perhaps he won't mind.

Best wishes always,

Bradley M. Davis

*Expect it, Bradley, in one of the next two issues of the Asa Gray Bulletin. — Harley

## MRS. ROY ARTHUR HUNT'S PITTSBURGH EXHIBITION OF BOTANICAL BOOKS, PRINTS AND DRAWINGS

H. H. Bartlett

THOSE who saw Mrs. Roy Arthur Hunt's exhibition of rare botanical books at the Clements Library in August, 1949, will not soon forget it. The occasion was a reception in honor of visiting members of the Botanical Society of America, convening at Ann Arbor at the start of the Summer field meeting. Because the Ann Arbor exhibition, for which the Clements Library generously provided a catalogue[1], was intended to cover only the earlier types of botanical book illustration, it included few items later than 1800. It had been preceded by others in various phases of bibliophily at the Grolier Club in New York City, the Cleveland Museum of Art, the University of Pittsburgh, and the Baltimore Museum of Art. It was followed in April, 1951, by a closely related exhibition at the National Gallery of Art in Washington, with fewer books but many original drawings, manuscripts, rare proofs, and unpublished prints. The Washington exhibition unfortunately had no catalogue, but attracted wide and enthusiastic attention. Many of the unique and more interesting items, however, were photographed for addition

[1]Fifty-five rare books from the Botanical Library of Mrs. Roy Arthur Hunt, . . . described by Harley H. Bartlett. Clements Library. Ann Arbor. 1949. (Bulletin LVII)

to the slide collection at the National Gallery of Art, and a good review was written by Mrs. Edward M. Cheston.[2]

Mrs. Hunt received request for repetition of the Washington exhibition under the auspices of institutions in several cities and has complied by installing it for the period January 3 to February 17, 1952, at the Carnegie Institute, Pittsburgh. Thence it will go to the University of Virginia and elsewhere.

The Pittsburgh exhibition opened January 3 with a lecture by Mrs. Hunt, entitled "Highlights of Botanical Illustration," which has been published in part.[3] There is also a beautifully illustrated catalogue in which Mrs. Hunt has collaborated with Miss Jane Quinby.[4] This is a notable contribution to botanical history and bibliography which historically minded botanists will wish to add to their libraries. It is for sale by the Carnegie Institute.

Mrs. Hunt has collected botanical books, prints, and the original drawings for them since she was a girl of fifteen and has built a great collection. This has been a labor of love, and has preserved much botanical literature that otherwise would surely have been lost during the post-war breaking up of old European private libraries at the end of World War I, a time which coincided with the prevalence of a lamentable mania for tearing up old and rare botanical publications containing color-plates to make these into lamp shades and other ephemeral articles for interior decoration. Botanists were commonly outbid at book auctions for rare botanical works, which would yield many times the prevailing price as books if ruthlessly destroyed. Mrs. Hunt and a few other private collectors have kept precious material of great historical value from the hands of despoilers, have studied it, and through such publications as her Pittsburgh catalogue have made it better known to botanists and others. She deserves great credit and much honor for what she has done.

Mrs. Hunt is Editor for Garden Literature for the Bulletin of the Garden Club of America, a member of the Women's Auxiliary of the New York Botanical Garden, and a good friend of the Clements Library and of the Botanical Gardens of the University of Michigan. In 1951 she was added to the roll of "Distinguished Daughters of Pennsylvania" in recognition of her work as botanical book collector and bibliographer. She is the President of the Hroswitha Club, a New York organization of women bibliophiles.

[2]Cheston, Mrs. Edward M. Mrs. Hunt's exhibition at the National Gallery. Bull. Garden Club of America 39, No. 4: 3 - 8. July, 1951.

[3]Hunt, Rachel McM. M. The art of botanical illustration. Carnegie Magazine, January, 1952 (pp. 366 - 369; 373).

[4]Botanical Books, Prints & Drawings from the Collection of Mrs. Roy Arthur Hunt. Department of Fine Arts, Carnegie Institute, Pittsburgh, 1952. (Pp. xvi + 63 + vii, 48 plates. Foreword by Elizabeth Morgan.) Price, $1.00.

# A FRIEND OF THE BOTANICAL GARDENS HONORED AT THE CENTENNIAL CONVOCATION OF NORTHWESTERN UNIVERSITY

EDSON R. SUNDERLAND, Professor Emeritus of Law and Legal Research, University of Michigan, was signally honored at the Centennial Convocation of Northwestern University, December 2, 1951, by citation for one of the hundred "Northwestern University Centennial Awards" honoring "a group of men and women selected for distinguished service to society while residing in one of the following states: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin." The citation reads, in part: "An outstanding legal scholar in the Midwest, Mr. Sunderland has been associated with the University of Michigan Law School for half a century. A vigorous advocate of reform in legal procedure, he spent six months in England, studying court procedure, in the twenties, and drafted the official forms of pleading adopted by the Supreme Court of Michigan in 1931. He also drafted the Illinois Civil Practice Act which was adopted in 1933. He is a member of the United States Supreme Court Advisory Committee for drafting rules for federal courts, and an honorary member of the bar associations of Chicago, Kansas City, Tennessee, and Pennsylvania."

Needless to say, Professor Sunderland's interest in our Michigan Botanical Gardens Association is that of an amateur, but he has botanical affiliations that are older than he is. His father, Rev. Jabez Thomas Sunderland, long pastor of the Unitarian Church in Ann Arbor, was a fellow student and close friend in theological seminary of Edson Sewall Bastin, who gave up the ministry to teach botany, first at the old University of Chicago (a fore-runner of the present institution of the same name) and later at the University of Pennsylvania. They remained close friends throughout life, and each named his son for the other. The sons met at the University of Michigan and in turn became life-long friends. They are Edson R. Sunderland, the lawyer of whom we write, and Edson Sunderland Bastin, who, until his retirement in 1944, was Professor and Head of the Department of Geology at the University of Chicago. Professor Bastin's half-sister, Dorothy Bastin, married the late Wilbur Esmond Brotherton, Jr., the writer's first doctoral student (Ph.D., University of Michigan, 1922), who was one of the first to carry on research at the Botanical Gardens after removal to the present location. One of his sons is Harley Bartlett Brotherton. — H. H. B.

# ADDITIONS TO THE COLLECTION OF VASCULAR PLANTS IN THE UNIVERSITY OF MICHIGAN HERBARIUM, FROM MICHIGAN, INDIANA, AND LATIN AMERICA

Rogers McVaugh

IN RECENT years we have attempted to modernize and make accessible all our collections from the State of Michigan and also from certain special areas in which the staff and students are working. The collections thus made available include not only those currently being received, but also numerous older collections which have been in storage. Some of the more important additions to the classified collections are listed below.

## MICHIGAN

The herbarium of Parke, Davis & Co., which was given to the University of Michigan in 1933, included approximately 3000 specimens from the collection of their longtime botanist, Oliver Atkins Farwell. Farwell had botanized for more than 50 years in Michigan, and his collections include a fine representation from Houghton and Keweenaw counties, in the Upper Peninsula, and also from southeastern Michigan, especially from Monroe, Wayne, Washtenaw, Oakland and Macomb counties. Over the years Farwell published numerous articles on the plants of Michigan, and included in his publications were more than 1300 new names for plant species and subspecific taxa. Many types and authentic specimens of Farwell's naming are present in the Parke, Davis & Co. set of his collections. The most important set of his plants is the property of the Cranbrook Institute of Science, but our set is hardly less valuable.

The largest recent collection which is now available is that of Carl O. Grassl, whose plants were taken in the course of an extended series of trips along the shores and on the islands of the Upper Great Lakes, in 1931, 1932 and 1933. The original accession included more than 5300 sheets, more than half of which are from Michigan. Many of the specimens were collected in Ontario, along the north shore of Lake Superior, or from Manitoulin Island and other islands in northern Lake Huron.

Beginning about 1916 and continuing for two decades, J. H. Ehlers collected extensively in the state, but principally in Emmet and Cheboygan counties in the vicinity of the University Biological Station at Douglas Lake. About 1000 sheets of his collecting have been added to the classified collection in recent years, and it is chiefly through

his efforts that we have such a fine representation from all the counties in the region of the Straits of Mackinac.

In 1942, at the death of Marcus W. Lyon, Jr., of South Bend, Indiana, the University received his entire herbarium, consisting of more than 3000 specimens. This is mentioned here although most of the specimens were from a single county (Porter) in Indiana. The Lyon herbarium was assembled in an attempt at a complete representation of the flora of the Indiana dunes, and the resulting collection is of great importance to us because of the proximity of the area to the southwestern counties of Michigan, and the relationships between the floras of the two areas. The collection is as yet largely unmounted, but is now available for study.

In 1950, through the kindness of Dr. Harry Truman and Mr. Edward G. Voss, of Denison University, we received in exchange about 725 sheets of Michigan plants from the herbarium of Gilbert H. Hicks, who had maintained active exchange relations with local botanists in the state for a number of years before 1900. The principal collectors, with their dates when known, are as follows: Corbin, N.D.; Crozier, A.A. (1886 - 94); Farwell, O. A. (1885 - 89); Etschman, E. (1876); Hicks, G.H. (1887 - 93); McLouth, C.D. (1889 - 99); Wheeler, C.F. (1875 - 94). We feel that many of these early collections are of unique interest because they reflect in some degree the conditions which prevailed before the original vegetation was entirely replaced by agricultural lands.

A similarly interesting, but smaller, collection of 117 specimens was presented to the herbarium in 1949 by Mrs. J. W. Bradshaw of Ann Arbor; the specimens were taken mostly in the vicinity of Little Traverse Bay, Emmet County, by Mrs. Bradshaw's mother, Mary L. Freeman, and the earliest collections were in 1888.

Among the smaller, or more recent collections, the following are of considerable interest:

A series of 240 specimens, mostly from the vicinity of Ann Arbor, collected in 1884 by G. B. Sudworth, and presented by Dow V. Baxter.

A collection of 182 specimens from Berrien County, the last collection made by C. K. Dodge. The field work was done in 1917, and the plants were still undetermined at the time of Dodge's death. In connection with the series of more than 500 specimens from Berrien County which were presented some years ago by the late Mr. Cecil Billington, the Dodge collection is expected to form the nucleus for future work in southwestern Michigan.

In 1946 F. N. Hamerstrom, Jr., made a thorough survey of the plants of the Walter S. George Reserve in Livingston County, and in 1950 the specimens were identified and made available for study.

The series of 358 sheets of beautifully prepared specimens will add greatly to our knowledge of that area.

In 1948 and 1949 Mr. Charles D. Richards collected extensively in Houghton and Keweenaw counties, with a view to investigating the validity of Fernald's nunatak hypothesis as applied to this part of Michigan. Mr. Richards' specimens, comprising more than 1100 sheets, are now mostly catalogued and available for study.

At the other end of the state, our scanty representation from the Lake Erie shores in Monroe County has been appreciably augmented by a collection of 321 specimens presented in 1950 by Mr. Malcolm McDonald.

Notwithstanding the addition to the herbarium of the more than 10,000 Michigan specimens enumerated above, we still urgently need collections from many little-known areas in the State. As pointed out by F. J. Hermann some years ago in his paper on Carex in Michigan (Amer. Midl. Nat. 25: 2 - 3. 1941), the north-central portion of the Lower Peninsula is very inadequately known. Although the shores of the Great Lakes have interested many botanists, it seems odd that the Herbarium contains almost no specimens from any of four adjacent counties on Lake Michigan: Benzie, Manistee, Mason and Oceana. Jackson, Lenawee, Hillsdale and Branch counties, within easy distance of Ann Arbor, are very poorly represented in the collections. Lapeer County, as may be seen by reference to the maps in Billington's Shrubs of Michigan, has been neglected by botanists. In the Upper Peninsula no county, with the possible exception of Houghton and Keneenaw, has been worked adequately. The preparation of a definitive State Flora will not be feasible until we have much more information about the plants of these little-known parts of Michigan, and we should like to encourage all botanists, either at work or on vacation, to fill these blank spots on the map by their collections and other records.

## LATIN AMERICA

Since the initiation of the Maya Project, in cooperation with the Carnegie Institution of Washington, some twenty years ago, botanists at Michigan have been interested in the flora of Latin America, and in particular that of Mexico. Through exchange and purchase and the collections made by staff members, the Herbarium is beginning to accumulate a representative series of the Mexican flora, and much of this series is now available for research. Some of the more significant additions to the herbarium are mentioned below:

From northern Mexico we now have available several large collections, including those of H. H. Bartlett, Howard Scott Gentry, C. H. Muller, and Stephen S. White. Bartlett's collection from the Sierra San Carlos, Tamaulipas, although made in 1930, is still of unsurpassed interest as representing the flora of an isolated highland east of the principal ranges of the Sierra Madre Oriental. The Gentry collections from Sonora, Sinaloa, and Chihuahua comprise more than 2000 sheets which have recently been catalogued, and in addition 218 sheets from Baja California received in exchange from the Allan Hancock Foundation and also more than 500 specimens collected by Dr. Gentry in 1948 in Chihuahua and Durango and presented by him to the Herbarium. White's collection, like that of Gentry, is mostly from Chihuahua and Sonora, but from the region of the Rio Bavispe, an area which was almost unknown botanically before White's exploration of it. It is now represented in the Herbarium by more than 3900 specimens. We were fortunate to receive in exchange, from the Herbarium of the National Arboretum, a set of the collection made by C. H. Muller in 1939, in Nuevo León, Coahuila, and Chihuahua; this comprises 656 sheets, and will be invaluable in future interpretations of the flora of this arid region of northern Mexico. In addition to the above we should mention the important collections made by Dr. Elzada U. Clover, of our own staff, in Nevada and Arizona. More than 1600 sheets of Dr. Clover's Arizona plants are now available for study, and many of these are from inaccessible and seldom-visited areas along the Colorado River. The affinities of the flora are largely Mexican, and Dr. Clover's plants should prove of great assistance in any work in the north-Mexican region.

Recent collections from south-central and southern Mexico have been relatively few, and are as yet mostly unavailable for general research use. They include a set of B. L. Turner's plants of 1950, from western Michoacán; Boone Hallberg's Oaxaca collection of 1950; about 230 sheets collected by Dr. Margery Carlson in 1948 and 1949 (mostly in Oaxaca), and several thousand sheets, mostly from Jalisco, collected in 1949 and 1951 by University expeditions.

From the West Indies, a region which is in general poorly represented in the Michigan herbarium, we now have two important collections from Haiti. The larger of the two, comprising 1060 sheets, was made by L. R. Holdridge between 1942 and 1945, and forms the basis for his vegetational studies on the island. A smaller collection, 277 sheets, was assembled by H. H. Bartlett. Neither collection is as yet available for general use.

From Central America our most important recent accessions are a set of the Petén collection made by J. A. Steyermark (365 sheets), and a large series of 681 specimens from Honduras, sent in exchange by Dr. L. O. Williams of the Escuela Agrícola Panamericana.

From South America we have a set (1596 sheets) of Mrs. Mexia's very important collection from Peru and Brazil, made in 1931 and 1932. We have also received, in exchange from Stockholm, 819 specimens collected by P. Dusén in Brazil, 1909 - 1915, and from Geneva 999 specimens collected in Paraguay by Hassler. These two latter collections are basic to any study of the botany of temperate South America, and we are fortunate in securing them.

It is expected that all the Herbarium's holdings from Michigan, and from Latin America, will be classified and available for research purposes in the near future. We should like to make the material as widely used as possible; and we hope that investigators in the University and in other institutions will take advantage of it.

## A MOBILE SUMMER SCHOOL OF PLANT TAXONOMY AND ECOLOGY

A new offering of the University of Michigan Summer School in 1952 will be a travelling course for students in Plant Taxonomy and Plant Ecology. The instructors are Dr. Rogers McVaugh, Dr. Elzada U. Clover and Dr. Pierre Dansereau. They plan to take a group of 20 to 30 advanced students through parts of Indiana, Missouri, Oklahoma and Texas, thus traversing parts of the deciduous forest, grassland and desert of North America.

Taxonomic problems as diverse as the phylogeny of grasses and cacti and the variation within a species of Tradescantia will be reviewed by Dr. McVaugh and Dr. Clover and studied in the field by their students.

Ecological investigations of the principal plant communities and of special features such as distribution of life-forms will be carried on by Dr. Dansereau and his students.

The travelling session will last 8 weeks altogether, for which students will obtain 8 credit hours. Camping out will be the rule, although several stops on university campuses have been scheduled. Students will be expected to provide their personal equipment and to take part in the camping chores.

Inquiries concerning the mobile school should be addressed to Dr. Pierre Dansereau, Department of Botany, University of Michigan, Ann Arbor, Michigan.

# VEGETATION SHOULD BE STUDIED AS WELL AS THE FLORA

Ann Arbor, Mich., 18 Oct. 1951

Professors Bartlett and McVaugh;

I would like to express my appreciation for your new venture in Michigan botany and wish it every success.

You may in time wish to organize a subcommittee on Michigan vegetation to parallel the one on Michigan flora. May I propose Professor Pierre Dansereau as the logical chairman for such a group.

I would like to call your attention to the small but active group of amateurs at Cranbrook interested in Michigan botany: Clarence Messner, 308 McKinley, Grosse Pointe, Mich; Dale Hagenah, 1961 Bethune, West, Detroit; George Thomson, 3107 Wabash, Detroit; Paul Thompson, 17503 Berkshire, Birmingham, Mich.; William Katz, 2339 Tyler, Detroit; Dr. Marion Hall, Cranbrook Inst. Sci., Bloomfield Hills. These certainly, and possibly others, will be interested in your project.

You may be interested in the fact that I have under way a series of studies on the occurrence of tree species in the original forest cover as recorded by the surveyors in the original rectangular land survey. The number of trees used as surveyor's witness trees is up to seven or eight thousand per county, and the number of species ranges up to thirty or forty per county. Since these records generally antedate both agriculture and lumbering in most places, and since the diameters of the trees are given, we are obtaining a good impression of the composition of the original forests. In some cases it is also fairly easy to determine the major cover types. Spot maps are being prepared for each species and diameter-density tables. The counties finished are Jackson and Washtenaw; other counties for which the data are complete are Macomb, St. Clair, Alpena, Ogemaw, and Antrim. Graduate students are participating in this program. As such studies are both time consuming and expensive, we do not anticipate having data on a large number of counties in the near future. County studies are suitable for Master's theses and for special problem credit. It is hoped that several persons may find it possible to cooperate in the project as the years go by. — Stanley A. Cain

# THREE SUMMERS OF BOTANIZING IN THE KEWEENAW PENINSULA OF MICHIGAN

Charles D. Richards

THE KEWEENAW Peninsula of Northern Michigan has long been known for its interesting flora which contains an assemblage of remotely isolated relic species and isolated endemics. To account for the occurrence of these plants, Professor M. L. Fernald proposed the "Nunatak Hypothesis" which is the theory that during the last phase of Pleistocene glaciation, islands of ice-free land occurred in the ice sheet and that vegetation persisted on these patches of land. After visiting the peninsula in the summer of 1934 Fernald[1] concluded that the higher conglomerate bluffs of Keweenaw County had escaped denudation by Wisconsin ice and that these bluffs supported the ancient vegetation during the Wisconsin period. Professor A. P. Coleman of the Royal Ontario Museum had earlier expressed a belief that the Slate Islands along the north shore of Lake Superior and the Bruce Peninsula in Lake Huron, both containing species of relict plants, had likewise been left as nunataks since they showed no evidence of glaciation. Most geologists, however, will not admit that any portions of the Upper Great Lakes region could possibly have escaped glaciation during any of the several advances of the Pleistocene ice. Consequently the "nunatak hypothesis" has fallen into disrepute, but the problem relative to the occurrence and the distribution of the relict plants in these areas is still of interest to the systematic botanist and the plant geographer.

I have had the good fortune to spend three years in the Keweenaw Peninsula during which time I was able to botanize in many of the more interesting areas. History of botanical exploration in the Copper Country, as the Keweenaw Peninsula is commonly known, dates back to about 1840 when Douglas Houghton, distinguished surgeon, geologist, and botanist explored the south shore of Lake Superior. Houghton was drowned off Eagle Harbor in 1845 and many of his specimens and notes were lost. Oliver A. Farwell, a noted student of Michigan botany, lived for many years in the Keweenaw Peninsula and studied the flora. Farwell's personal herbarium is now possessed by Cranbrook Institute of Science, but there were duplicates of many of his more important collections in the Herbarium of Parke, Davis and Co., now at the University of Michigan. L. H. Bailey studied the Carices of the northern half of the peninsula and

[1]Fernald, M. L. 1935. Critical Plants of the Upper Great Lakes Region of Ontario and Michigan. Rhodora 37:197-222, 238-262, 272-301, 324-341.

published on them in 1890.[2] M. L. Fernald and A. S. Pease contributed importantly to our knowledge of the Keweenaw Flora, when on their botanical trip in 1934 they discovered several new plants. Frederick J. Hermann, another student of the Michigan flora, has botanized extensively in the Keweenaw Peninsula, paying special attention to the genus Carex. Hermann's collections are well represented in the University of Michigan Herbarium.

With the work of this distinguished group of botanists behind me, I have attempted to explore further the Keweenaw flora in hope that I might be able to add something more to our knowledge of its structure and distribution. Regardless of what degree of success I may have had in accomplishing this objective I have derived real pleasure from the seasons of botanizing in this most interesting part of our state.

An enumeration of a few of the more interesting Keweenaw localities botanized by myself follows, with brief mention of some of the more unusual plants that occur at each.

## KEWEENAW COUNTY

### 1. Manitou Island

This island is located about two and a half miles west of Keweenaw Point. I visited it on June 17, 1950, and was astonished to find that the season was at least two weeks behind that of the mainland. Marsh marigold, spring beauty, and trillium were in flower still. Maple and juneberry were just beginning to produce their leaves of the season. The island is uninhabited except for the occupants of the coast guard station at the eastern end. There are no roads but it was possible to explore the island by staying close to the shore line. The dominant vegetation is spruce and balsam. The western tip of the island supports a dense thicket of mountain maple and yew. The latter forms a solid ground cover which is quite impenetrable. Finding such a large stand of yew on the island was a surprise since it is practically absent from the northern part of the peninsula. I have found only one station for yew on the mainland of Keweenaw County and the two or three shrubs of it there were nearly dead.

Open rock outcrops at the eastern end of Manitou Island shelter luxuriant colonies of Draba arabisans Michx., Castilleja septentrionalis Lindl., Achillea borealis Bong., and Primula intercedens Fern. Trisetum spicatum var. molle (Michx.) Beal grows in the rock shore crevices.

[2] Bailey, L. H. 1890. The Carices of the Upper Half of the Keweenaw Peninsula. Bull. Torr. Bot. Club, 17:61-64.

2. Copper Harbor

This locality is a beautiful natural harbor on the north side of Keweenaw Peninsula near its tip. Both the eastern and western peninsulas of the harbor, as well as Porter's Island, are interesting to botanize. In the rock-shore crevices one can find Viola adunca Sm., Arabis lyrata L., Achillea borealis Bong., Trisetum spicatum var. molle (Michx.) Beal, Carex Garberi Fern., Senecio pauperculus Michx., Primula intercedens Fern., Aster ptarmicoides T. & G., Solidago Randii (Porter) Britton, etc. To the south of the harbor is the old Copper Harbor Cemetery. Here, on the talus above the cemetery, grows a large colony of Arnica Whitneyi Fern. which is endemic to Keweenaw County. One mile north of Copper Harbor, on the shore of Lake Fanny Hooe, is the site of Fort Wilkins, which, with a surrounding tract of land, has been made into a state park. Here Vaccinium membranaceum Dougl. is one of the most abundant shrubs. This western blueberry produces large, black, tart fruits which are gathered every year by campers and picnickers. I prefer the flavor of this blueberry to that of the other local species and we had excellent results freezing them for winter eating. Vaccinium ovalifolium, Sm. is another western blueberry which occurs here but it is not nearly so common as V. membranaceum.

Fort Wilkins is a station for the lovely little orchid Calypso bulbosa (L.) Oakes which can be found in mossy depressions in the spruce-balsam woods about the middle of June.

In the forest east of Lake Fanny Hooe grows Adenocaulon bicolor Hook., a composite whose range is chiefly in the western United States and Canada.

3. West Bluff

This locality has been made famous as a result of Fernald's hypothesis that it was a nunatak during Wisconsin glaciation. Fernald visited West Bluff in 1934 and botanized it rather thoroughly finding such western plants as Woodsia oregana D. C. Eat., Potentilla pensylvanica L., Carex Rossii Boott, Ceanothus sanguineus Pursh, and Chamaerhodos Nuttallii Pickering. The last one Fernald separated from the western plant as var. keweenawensis Fern. on the basis of its hispid stem. This plant occurs only on a single wind-swept slope of the bluff in gravelly soil. Ceanothus sanguineus is found sporadically along the edge of the bluff often occurring with the related species C. ovatus Desf. It is more abundant, however, on a ridge north of Lake Bailey which is about 2 miles east of Eagle Harbor. Here it forms extensive thickets which make a beautiful sight in June when it is in blossom. The construction of the road and the clearing of the woods north of Lake Bailey seem to have

favored its development over a much greater area than it formerly occupied.

4. Mt. Lookout

Mt. Lookout lies immediately south of Lake Bailey and is similar to West Bluff in geological structure. Its bald, conglomerate summit can be reached only by trail, whereas that of West Bluff is accessible by a good road. The thin gravelly soil on the summit of Mt. Lookout supports a number of xerophytes such as Potentilla tridentata Ait., Festuca saximontana Rydb., Artemisia caudata Michx., Selaginella rupestris (L.) Spring, Draba arabisans Michx., Woodsia ilvensis (L.) R. Br., Prunus pumila L., Juniperus horizontalis Moench., and Juniperus communis var. depressa Pursh. Most of the western plants which have made West Bluff a curiosity botanically are not found on Mt. Lookout although conditions seem to be identical and the difference in altitude is only about 7 feet. One of the striking features about the vegetation on the summit of Mt. Lookout, as well as that on West Bluff, is the depauperate condition of the trees and shrubs. Oaks with large crops of acorns may not be more than two or three tall. Choke cherry and june berry are often prostrate yet flowering and fruiting abundantly. This depauperate condition is evidently due to the strong winds which sweep up the north face of the bluff from Lake Supèrior and no doubt the heavy accumulation of snow on the north slope during the winter months aids in dwarfing the woody vegetation.

5. Mt. Houghton

Mt. Houghton is located directly north of Bete Grise Bay and is 1479 feet high, the second highest peak in Keweenaw County. Its slopes consist of various modifications of diabase. Its summit consists of a pink, hard, brittle felsite of great thickness which is exposed on the south side as a steep slope. This rock slope supports a luxuriant growth of mosses and Selaginella rupestris. The greater part of the mountain was burned over in recent years and most of the original vegetation has been destroyed. However, it is now an interesting location for studies of succession on a burned area. Polygonum Douglasii Greene, Collinsia parviflora Dougl., Woodsia ilvensis (L.) R. Br., Woodsia oregana D. C. Eat., Arabis Drummondi Gray, Corydalis sempervirens (L.) Pers., and Campanula rotundifolia L. grow on the rock slope at the summit. The burned lower slopes are largely dominated by bracken fern and fireweed, but such interesting plants as Polystichum Lonchitis (L.) Roth and Festuca occidentalis Hook. can also be found there.

6. The Cliffs

The Cliffs are a part of an ore-bearing range extending southwest from the village of Phoenix. Sometimes known as Greenstone Ridge, they are formed of massive, dark-colored rocks which have persisted by virtue of their great resistance to weathering. Formerly there were several copper mines along this range but they have been abandoned for many years. The village of Clifton at the old Cliff Mine site is now in ruins and the interesting old cemetery has grown up in weeds. This was one of the earliest areas in the Keweenaw Peninsula to be botanized and it still yields many interesting finds to the botanist. Crataegus Douglasii Lindl. is a common shrub on the open hillside around the old village site. This black-fruited haw has a wide distribution on the Pacific Coast and in the Rocky Mountains but in the east it is found only in Northern Michigan and Southwestern Ontario. One can find numerous species of ferns at this locality. Woodsia ilvensis (L.) R. Br., Asplenium Trichomanes L., Dryopteris fragrans var. remotiuscula Komarov and Polypodium virginianum L. are common on the rocks of the talus slope. Polystichum Lonchitis (L.) Roth and Polystichum Braunii var. Purshii Fern. grow in the moist wooded ravines along the range. In these same ravines one will find Corallorhiza striata Lindl., Goodyera oblongifolia Raf., and Melica Smithii (Porter) Vasey, which are of widespread occurrence in the Western United States and Canada.

## HOUGHTON COUNTY

7. Grand Traverse Bay

This broad sand bay is located on the eastern side of Keweenaw Peninsula. The shore vegetation is typical of that of many other sandy beach areas on the south shore of Lake Superior. Ammophila breviligulata Fern., Hudsonia tomentosa Nutt., Deschampsia flexuosa (L.) Trin., Prunus pumila L., Comandra umbellata (L.) Nutt., Vaccinium angustifolium Ait., and Lathyrus japonicus Willd. are the more conspicuous beach plants. Behind the beach, and extending nearly to Rice Lake, is an old Sphagnum bog in which jack pine is now the dominant plant. This bog is one of the few stations in the Keweenaw Peninsula for Betula glandulosa Michx. West of this bog is Rice Lake, which is a garden spot of aquatic vegetation.

8. Lake Perrault Bog

This is a typical bog lake about 3.5 miles west of Painesdale in hardwood forest. It is skirted by a broad floating Sphagnum mat upon which grows Ledum groenlandicum Oeder, Kalmia polifolia

Wang., Andromeda glaucophylla Link, Vaccinum Oxycoccos L., Calopogon pulchellus (Salisb.) R. Br., Arethusa bulbosa L., Pogonia ophioglossoides (L.) Ker., Cypripedium acaule Ait., Eriophorum spissum Fern., etc. At the outer edge of the mat black spruce, tamarack, northern white cedar and mountain holly form a thicket which holds the snow until very late in the spring. I have visited Lake Perrault Bog the first of June when I had to wade through snow up to my knees to get out to the mat. The forest surrounding the bog is typical of the hardwood forest which covers much of the northern Peninsula. The dominant tree is hard maple with occasional yellow birch and hemlock. Mosses, ferns, and clubmosses form the principal ground cover.

9. Silver Mountain

Silver Mountain is a bold hill of diabase south of Alston. It is about three-fourths of a mile in length trending northeast. Its northwestern face is a long gradual slope, its southeastern a bold precipice 400 to 500 feet high. Most of the mountain has been burned rather recently exposing large areas of bare rock. These areas are beautifully striated from glacial action. Vegetation on the northwestern slope is rather scant but mosses and Selaginella are beginning to cover the exposed rock. Juneberry, choke-cherry, fire-cherry, raspberry, blueberry and bearberry are establishing themselves in many places. The southeastern face escaped denudation by the recent fire and is still covered by the original vegetation. The rock ledges at the side of the precipice are covered with ferns and mosses. Celastrus scandens L. is well established on the talus at the base of the precipice. This shrub also occurs on the talus of several bluffs in Keweenaw County but I have never found it with ripe fruit in the Keweenaw peninsula. I believe the growing season must be too short for fruit to mature. It is also interesting that this shrub is found nowhere except on talus in this part of the state. On this same talus at Silver Mountain I have collected Dirca palustris L. abundantly fruiting.

These are only a few of the many localities in the Keweenaw peninsula that are botanically interesting. Space prevents the mention of others. Near by, but not in the peninsula itself, are other areas of interest to the botanist. The Huron Mountains in Baraga and Marquette Counties, the Porcupine Mountains in Ontonogan County, the Black River Region in Gogebic County and the Jack Pine Plains in Baraga County are a few such areas outside the Keweenaw Peninsula which are botanically attractive.

# A LETTER MOSTLY ABOUT OAKS AND PLUMS

Charles C. Deam

Bluffton, Indiana, Jan. 19, 1952.

Dear Mr. Bartlett:

The generous supply of separates of the article on the Deam oak* was received several days ago and this tardy reply is due to ill health. I had planned to write you yesterday but this and that came up so I could not get a start. The same today and it is now 8:00 p.m. In life it seems as if we do not always get paid what we think we deserve. In high school we translated Cicero's Old Age and Friendship and I paused to locate the translation which I often read, but I can not find it but only the original in Latin. There is much to be gained by a long life which one can not appreciate until it comes.

Well I think you did an excellent job in your study and writing up of the Deam Oak. I sent you an old photo of the oak. My first photo shows it as it was, I think, in 1914 when rail fences enclosed it and my motor cycle was parked along the fence. I think that now only the two trees to the left are standing. You can see the old sign on the Deam Oak. Well we deeded the 3/4 acre to the state and they have it now well fenced, etc.

I learned something this summer. The tree was just loaded with fruit in July and I was jubilant. I no longer drive a car but had my wife to drive me down there the last week in Sept. to gather a good supply of the acorns but to my surprise all had aborted and were on the ground. Then I came home to observe my Quercus Bebbiana which is quite accommodating in that it fruits almost every year. Early in the year it was loaded but on account of my paralysis I did not see it often. But lo when I went to get acorns this year they were all aborted and on the ground. Then I recalled that we had a drought in Aug. and Sept. although we had a few light showers to keep the grass green, but the deeper soil was very dry.

Your write-up was complete and I noted no errors. Here is an observation that might interest you. The first year I grew seedlings

*This article, "Regression of X Quercus Deamii toward Q. macrocarpa and Q. Muhlenbergii" (Rhodora 53: 249-264. 1951) will be sent to anyone interested, on request. — H. H. B.

I planted one of the most vigorous ones. To my surprise and disgust, so far as I could learn, the seedling tree was true Q. macrocarpa. This was before I was aware of the segregation of the progeny. Every year it had Q. macrocarpa leaves and when about 2 inches in diameter I dug it up, — disgusted. I have never in my life planted an ordinary bur oak acorn and I pride myself in being meticulously careful, etc. But there was the darn bur oak just the same. At the same time I gave a farmer about a half dozen seedlings and he planted all of them in his thick woodland, except one in his yard. All in the woodland were broadleaf type and were shaded out. But the one in the yard, which is now about 4 inches in diameter, I think is a hybrid. Well the bur oak varies greatly. I have a native tree here more than 2 feet in diameter of the form with long acorn, var. olivaeformis. We have a fine tree 4 mi. from here of the form Fisherii. It has the scales of the cup inturned. All scales of all acorns are not completely inturned but when I show the nuts to the amateurs they say "Quercus lyrata". Many years ago I found a tree with very large ovoid fruit and the scales of cup coalescing. Fool-like, I did not take some to plant. I did gather a quart for a museum specimen and I have never been able to return to this tree and doubtless now I never can. I have just one chance in that I can get Ray C. Friesner to look it up. Friesner is the best man living; you are no exception. He is the most active taxonomist now in Indiana. This week I received a letter from him in which he writes: "Have been very busy planting 300 to 400 pots of acorns. I want to study variation of leaf pattern, etc."

Well I am still working on a revision of the trees of Indiana and that Quercus coccinea and Q. ellipsoidalis complex got me. So I sent my specimens to Friesner for him to mull over, but he did more than that. I suggested that he take up the study and learn the range of Quercus ellipsoidalis Hill. Well he fell for it and more too. He at once started to collect, etc. I thought I had the whole business in a poke when I sent him my specimens. My material was mostly of my own collection but I did have a few "exotica" from outside Indiana. I had decided that the impressed rings and depressions about the apex of the nut sharply and accurately separated the two species. When I make a specimen, I do, if I can, collect a sufficient number of acorns to make a critical study. I always (in later years) carried a jointed pole pruner and made several sheets for exchange, etc. O. K., but Friesner went over the nuts with a fine-toothed comb, and by dern if he did not kill me off. These apical rings are more pronounced south of northern Indiana and in all "exotic" specimens. I had one specimen from an Ohio River county that had one peduncle with two acorns on it. One was quite typical, with the rings, but the other had no rings. So now what?

Friesner is still speechless about it. He will have a pile of material next year if all goes well. He gets up before day, and is at destination by day. He came here this fall about day light, — 110 mi. He goes all day and gets in after dark and works the greater part of the night to put up his catch, — a la Deam 25 yrs. ago.

Now I must get to the end as my eyes can not take it and my strength neither. This is my first real effort this week. I am now working on Prunus. In it there is neither rhyme nor reason. Hedrick & Wight made a study and Hedrick died last fall. The F. P. (Fool-proof) characters criss-cross so much it just does not make sense. Our arborescent plums are Prunus americana and the var. lanata Sudw. (a la Gray, ed. 8). The trouble is with P. hortulana and P. Munsoniana. I think the common idea is that "P. americana forms clones and we always find it in thickets". All right, but I have two trees here over 6 inches in diam. that I dug from the woods about 25 years ago and to date not a sucker (except me, waiting to learn what they will do). Well the var. lanata is a complex and from my observation must be planted in mass and mass collections must be studied. Too, P. hortulana does not sucker; stone is pointed at both ends; fruit ripens early Sept. into Oct. P. Munsoniana suckers freely; stones are turgid, abruptly truncate at base; fruit ripens July to Aug. Well you can get crosses of the prime characters. Non-suckering (P. hortulana) with fruit ripe any time from July to Oct. P. hortulana, which should have pointed fruit, will have base of stone obliquely truncate. Well I have worried with these now for two years, and I plan to write it up as I see it. There is not much literature on the group but it is as hazy as can be. Well, if I persist through this year I will have another chance at them.

I thank you for your study to bring the Deam Oak into its own. There is nothing like making good your obligation and promise.

You and Dow Baxter (a very fine fellow) were due to make a visit here in 1951. It seems as if even the politicians can not make good. Well I must add some news. N.C. Fassett was night guest on New Years. He and son Charles, 19, were off to Salvador, C. A., to start a study of Callitriche in Central America.

You may have learned my good friend Frank T. McFarland is now living and teaching at Baton Rouge. You know Fred Loew died and his place has gone to the "dogs".

There will be a heck of a reunion at Huntingdon College on the last of this month I believe. The exercise will begin early, and at 3:00 p. m. basketball. I cast the notice in the waste basket. I put basketball and football in the same class as alcohol, tobacco,

gambling, etc. Then last week another dam thing irritated me. Our State Forester has 2 million multiflora roses to give away for "live fences". I wrote the head of the Department of Conservation he need not worry about a tombstone: he will be remembered O. K. by disseminating this rose pest all over Indiana. I have a sample left here in our arboretum of about 100 ft. square and I am sure there are more than a hundred seedlings brought in by Jay birds from 3 bushes along the river. Bartlett, our Dept. of Forestry is at zero. If I am murdered, I have talked too much. Now 11:16 p.m.

Remember your trek down here. With my very best wishes, I am

Sincerely yours,

Charles C. Deam

## NEWS OF DR. AND MRS. JOHN H. EHLERS

Dr. and Mrs. John H. Ehlers are living at 1160 Holland St., Lakewood, Colorado. After retirement, in 1939, Dr. Ehlers actively continued floristic study and systematic collecting wherever he went and prepared many valuable specimens with the unusual care that always characterized his field work. As will be seen from the following letter from Mrs. Ehlers, he is no longer able to be so strenuous. He and Mrs. Ehlers continue to enjoy such events as the exhibitions at the Denver Art Museum. They are especially interested in the program of that Museum for publicizing contemporary American Indian art, which is living and growing, not merely a subject for archeological and ethnographic study. Her many friends remember that in Ann Arbor days Mrs. Ehlers was active in local art and historical groups as well as in botany.

Dr. Ehlers, at first single-handed and then with the help of Mrs. Ehlers, did vastly more than all others together in the years following 1919 to restore and reestablish the University Herbarium after the disastrous fire of 1913 in the old South Wing of University Hall, when the smoke- and water-damaged collections, many of which had been thrown out of fourth floor windows, were considered by some as an irretrievable loss. Dr. Ehlers taught Botany at Michigan from 1915 to 1939, served as Curator of Phanerogams during most of that period, and labored unremittingly, days and evenings, almost literally 365 days a year, for the Department and the Herbarium. Many former students and other friends will be interested in the following letter from Mrs. Ehlers, who, in her days of teaching botany at Colorado College, was Lois E. Smith.

Lakewood, Colorado, October 30th, 1951.

Dear Harley:

John wants me to answer the letter we received from you one day last week. But he doesn't know what he'd like me to say in the letter, nor do I know just how much you'd like to have from us for the purpose you have in mind. It sounds like a very worthy project to me, but it certainly will mean much work on somebody's part, — probably more than one somebody.

This will begin when we left Ann Arbor in early February of 1938 with my sister Osie, Mrs. Melville Fuller Coolbaugh of Golden, Colorado. As you know, we left because John had been in bed for weeks previously with gangrene in his bad heel. We got off the limited in Denver on a beautiful sunshiney Sunday morning, and one week from that day John was able to put shoes on. He continued to improve, but didn't want to drive our car down to Arizona himself. So we went down through Southern Colorado and New Mexico to Tucson and Phoenix when my youngest nephew, David Coolbaugh, had his spring vacation from high school. Dave went home by train, leaving us in Phoenix, where his oldest brother, Jack, and his family were living. We had expected to stay in Phoenix but a doctor there advised John to go to Tucson to have a doctor look after his feet, as this man was the best one in Arizona for that work. He proved to be excellent and John continued to improve under his care. We collected on the way down to Arizona, while we stayed in Tucson, and also on the way back to Colorado. We had a beautiful trip back north by a different route, which included a stop at the Grand Canyon of the Colorado River. A short time after we reached Golden, John drove back to Michigan to teach his last summer up at Douglas Lake. In Ann Arbor again, he taught one more semester in the Botany Department of the University of Michigan before his retirement in early February of 1939.

Then he came to Golden once more and we went back to Tucson after he'd spent a few weeks in Colorado. Once more we went by the southern route, collecting all the way. We collected also while staying in Tucson and also on the return trip by the northern route. Back in Colorado once more we spent the summer in an auto court just south of the Garden of the Gods, in the Colorado Springs region, collecting all summer in that part of this state. We went up to Golden about the middle of September and spent about 6 weeks in a mountain cabin at Marshdale, not far from Evergreen, which is in Bear Creek Canyon. We also collected in that region. About Feb. 1, 1940, we started for El Paso with our Mother Smith,. expecting to leave her with her son and his wife in Dallas and then go

on leisurely to Florida, collecting along the way. When we were about 20 miles from Las Vegas, N. M., we had a bad accident and spent all of February in a hospital in Las Vegas. As the car was smashed, we returned to Denver by train. Sometime in April we took an apartment in an auto court in Lakewood, between Golden and Denver, where we stayed until June. After a week or two in the Coolbaugh home, we drove to Ohio to visit John's mother and sisters, before going on to Ann Arbor for the summer in our home there once more. Toward the end of that summer we went up to the Ehlers' cabin in the Upper Peninsula for a visit with John's sisters. . . . John returned to Ann Arbor to determine western plants until we drove back to Colorado in November. From January to June of 1943 we were again in Lakewood, a western suburb of Denver. From June to November we had a mountain cabin in the Mt. Vernon Country Club region, back of Golden in the mountains. There was a big enclosed porch from which we had a magnificent view out over the plains to the east of us. In November 1943 we moved to Denver, and in 1944 to Lakewood again. . .

Last year John was seriously ill for weeks and weeks in the Spring and Summer. My sister and her husband were so good to us and did so many things to help us. John gradually grew better and a series of X-ray treatments on his feet finally got him into better shape once more. He has not, however, been in quite as good health since that time as he was before. All these years he's had to go to his Golden doctor frequently for treatment of his feet. For more than two years he's gone at least once every week. The first years we were at this location he had a fine vegetable garden each summer, but these past two summers has been able to raise but little. Both years he was able to do some work in his strawberry beds, however, and has greatly enjoyed the berries from his everbearing plants. Both years he's also had some fine chard, and last year he had some corn, but this year's corn was planted too late to ripen before the first September frost. He enjoys being able to do some work out in his yard:— we have a fair sized one.

He is sorry not to be able to go out in the country collecting any more but the condition of his feet prevents. He keeps up membership in some of his scientific organizations and still gets certain scientific publications each month.

As it seems to me I've covered these past years fairly well, I'll now bring this letter to a close. If John wishes to add on some more he can do so after he's read what I've written.

With best wishes to yourself and for the new undertaking,

Sincerely,

Lois E. S. Ehlers

# FLORISTIC STUDY IN THE DOUGLAS LAKE REGION OF MICHIGAN, 1951

Edward G. Voss

THE SEASON was a significant one for study of the flora of the region of the University of Michigan Biological Station because of the opportunity for early spring collections. During two week ends in early May, a variety of habitats were visited in Emmet and Cheboygan Counties, and duplicate sets collected for the University Herbarium and the Biological Station Herbarium. Field notes and mass collections of Primula "intercedens", were made May 12, at its prime.

Special attention this year was paid in these two counties to botanizing in those parts which have previously received little or no attention, chiefly in the southern portions, in beech-maple woods and in a number of bogs. New county records obtained include several indigenous as well as adventive species. Dr. Pierre Dansereau and Dr. Carroll Wood, Jr. (University of North Carolina), contributed several of these records. In addition to new county records for such spring species as Claytonia caroliniana, Dentaria diphylla, and Dicentra cucullaria, the first regional reports for the following species collected this summer can be made: Centaurea diffusa (first collected in 1948), Oenothera nuttallii (collected by C. E. Wood), Pycnanthemum tenuifolium, Silene armeria, Silene conica, Viola lanceolata (first collected in 1949), Xanthoxylum americanum (only report for Cheboygan County is dot on map in Billington's Shrubs of Michigan, but there is no specimen in the University Herbarium or the Biological Station Herbarium). Some other material appears to represent new records, but is awaiting more critical attention.

Extensive field work also added to our knowledge of the distribution of less well-known species within the region. The aquatic flowering plants received particular attention from Dr. Wood in regard to distribution. Among the species previously thought to be scarce in the region which are now known to be much more common are Acorus calamus, Alisma subcordatum, Brasenia schreberi, and Selaginella apoda.

In spite of the fact that the Biological Station has completed its forty-third season, it is apparent that much floristic and taxonomic work on the plants of the region remains to be done. An accurate spring and fall picture of the flora has been lacking because botanical work has so generally been limited to the eight-week session of the Biological Station. My past season's collections aggregated

218 numbers, largely from seasons or localities previously unrepresented. I am indebted to the Denison University Research Foundation (Granville, Ohio) for a grant which aided in the extended field work this past summer.

## THE DEATH OF DR. LOUIS HENRIK JORDAL
## A LETTER FROM HIS BROTHER, ODD JORDAL, AND A MESSAGE OF CONDOLENCE FROM DR. FOUAD STEPHAN

THE DEATH of Louis Henrik Jordal, Research Associate, Botanical Gardens, University of Michigan, in an airplane crash near Teheran, Iran, just before Christmas, is mourned by his many devoted friends at Ann Arbor, Washington, and elsewhere. Jordal had gone as Visiting Professor of Botany to the Royal College of Pharmacy, Baghdad, Iraq, for the academic year 1951 - 52, and had taken advantage of the holiday vacation for a visit to Teheran. The plane on which he travelled could not land at the Teheran airport because of low visibility, and had been advised to turn back toward Baghdad. The crash remains unexplained, for there were no survivors.

A biographical account of Dr. Jordal is in preparation but must be held for a later issue of the Bulletin, awaiting essential data which are not yet available. A letter from his brother, Odd Jordal, has arrived in time for this issue, and follows, together with a letter of condolence from Dr. Fouad Stephan, Acting Director of the Royal College of Pharmacy.

Baghdad, December 25, 1951

Dear Sirs:

I am very sorry that I must communicate to you the following bad and sad news about Dr. Louis Henry Jordal.

He wanted to spend his vacation in Teheran (Iran), and took the plane from Baghdad on Saturday, December 22, 1951 at 4:30 p.m. She reached Teheran at 8:00 p.m., but due to a snow storm the plane could not land there. She circled over the city for about two hours, then crashed. The remains were found about seven miles from Teheran, but no survivals at all.

On the plane there were 16 passengers among whom Mr and Mrs. Bennett of Point IV and Dr. Jordal.

We are extremely sorry for this great loss, the loss of this promising great Botanist.

I give you my best sympathy. I remain,

Respectfully yours,

Dr. Fouad Stephan, Acting Director
Royal College of Pharmacy, Baghdad, Iraq

Oslo, Norway, 16-1-52

Dear Professor Bartlett.

I want to express my feelings of thankfulness for your comforting letter I just received in connection with Louis' death. As you see I have now left America and live in Norway. Your letter was first sent my sister who now lives in Washington. She readdressed it to me. I arrived in Norway two weeks before Christmas, and we got the sad message about the plane crash at 5 p.m. on Christmas eve, so you understand this Christmas was far from merry to us. We have not received any official report concerning the crash yet. All we know is what we have gained from newspapers and what friends of Louis in Teheran and Baghdad have written. Louis was on the way from Baghdad to Teheran to spend the Christmas vacation with an old schoolfriend from Emmanuel Missionary College, Kenneth Oster, who is now a missionary for the Seventh Day Adventist denomination in Iran.

The remains of Louis were cremated in Teheran and his ashes shipped to Oslo, Norway where his funeral will take place today at 1 p.m. As you know, Louis was my only brother, and the ties which bound us together were very strong. I think I can say that we stood closer to each other than brothers usually do, and I feel very lonesome now when he is no more alive. Louis and I have been through so many incidents in life together, and the age difference between us was only two years, so it was almost like the one was a part of the other. Louis, being not married and in many ways a peculiar man was rather lonesome in life. He had a great heart for his parents, sisters and for me. As you probably know, we spent a summer together in Alaska, and he stayed with me last year in Washington. Both my father and myself as well as Louis have always been outdoor men and we have spent numerous days together in the mountains and in the forests, and in that way we possess a multitude of happy memories from the days when he was among us. Our grief and sorrow on this day of his funeral is therefore without limits.

You ask for some information about Louis, from his childhood and otherwise. I am not able to give you that information right now, but I will write you a little later. Louis left his collecting notebooks in various places. I believe he took some with him to Baghdad, and some are still in Washington where they are stored together with his other belongings in the apartment of my sister, (Erna Keyn, 331 Flower Ave. Takoma Park, Washington D.C.). His belongings will be sent home both from Baghdad and Washington and I will be glad to transfer those books to you as soon as I can. Louis also left some botanical material and technical books in the field of Botany. Most of this material is in Washington. I have written his two friends, Howard Crum and Hansford Shacklette, and told them that they can take his botanical books and material to keep in kind memory of Louis.

Since I have just arrived from the States I have not had time to move into my apartment, but as soon as that is done I will get access to some materials and pictures which I think will be of interest. I will send them as soon as possible. May be it will come too late to be printed in the first journal but you can count on getting it in time for the April issue.

On behalf of my parents, sisters and myself I once more thank you, Professor Bartlett, for your kind words of sympathy. I know that Louis had a high regard for you and he spoke often about you both to me and to his parents. I know you have been of great help for him in his studies. If it had not been for all the help you had extended to him, Louis probably would not have been able to finish his degree. These are not my words, but Louis often mentioned that himself. If anything is written or printed in connection with Louis or his work over there, then we would like to get copies of it. Well, I have to bring my writing to a close because it is just about time for the funeral. All of us here are sending you our best greetings.

Sincerely yours

Odd Jordal
Kingosgt. 1 Oslo Norway

The address of my father, Pastoer Ole Jordal, is the same as mine.

## TO THE EVENING PRIMROSE

Harold J. Brodie

Pale yellow flower on a verdant wand,
Unfold thy satin petals to the night
And hold in trust until the day hath dawned
Thy treasure of the waning golden light!

And in the gentle darkness catch the ray
Of moon and stars, the ghostly moth to guide;
Adorn the shadowed meadow where by day
Sun-worshippers, the daisies, opened wide.

The students of thy secrets tell the role
That thou didst play — how valiantly didst strive
When aeons of vicissitude took toll
Of all but those the fittest to survive.

Plain modest flower, what hath made thee strong
When ruder forms than thine were bent to earth?
What hidden virtue carried thee along
And through the tests of time assured rebirth?

Thy glaucous leaves press earth in close embrace
Against the droughty winds until, at length,
Thy bloomy spike shoots upward from the base:
Foundation firm rewards thee with the strength.

Deep in thy very gene-stuffs didst thou bear
The brunt of chance misfortune from the start;
Yet saved from chaos every mating pair
By interchange of equal vital part.

When bludgeoning of cosmic ray made sterile,
Like poison against poison didst thou pit
The lethal genes and overcame the peril:
In harmless pairs the lethal genes now fit.

Nor yet had Fate conceded thee the field;
Thy flower form condemned thee to the threat
Of marriage close that might thy doom have sealed
If feeble offspring thou didst thus beget.

Thy lethal genes destroyed the closest mate
And lavish pollen gave fertility:
Thus may thou increase sure, nor e'er abate;
Thus may it be through all eternity!

Adversity's fair Child, raise high thy head!
Show whimpering Man thy golden crown unbowed;
O'er barren fields thy gracious beauty spread
Display thy hard-won laurels, ever proud!

# A LETTER ABOUT RESEARCH ON BIRD'S-NEST FUNGI, AND OTHER MATTERS

Harold J. Brodie

Department of Botany, Indiana University
Bloomington, Ind., November 21, 1951

My dear Uncle Harley:

How often we wish we could go to Ann Arbor to see you or that you could come here to see us. Failing either, I should at least maintain contact with you by correspondence better than I do.

You would find us all well, busy, older and possibly a little wiser. We love our life here where so much is offered as opportunity for myself in research and as a cultural background for our lives. My one cause for concern is the children's education. . . .

My own work has gone along slowly. I shall probably never startle the world for I am no genius. Yet in time I have, perhaps, made a small contribution. My recent work on the Nidulariaceae has created enough interest so that I was invited to give a paper at Stockholm last year and, as you may know, I did go.

I plug away quietly at problems of sexuality, etc., but recently I am trending more toward the "new" taxonomy. I want to produce a monograph of the Nidulariaceae and I am finding that many problems of taxonomy, speciation, distribution and the like can be solved by culture methods. For example, the "species complex" in one supposed group of the Nidulariaceae turned out to be nothing more than the variation of one species (see my paper on Cyathus stercoreus in Mycologia). More recently I showed that C. albus and C. anglicus have one pair of sex-type genes in common and have aleles of the other pair and I concluded that the two fungi are forms, not species.

But I must straighten out the purely taxonomic mess in that group and to that end I wish to work over Tulasne's collection in Paris and Berkeley's at Kew. For that purpose and to complete my book, I'm applying for a Guggenheim. I don't expect to get it because one has to be a biochemist to be an accredited "botanist" nowadays, but it will be fun to try anyway.

Under separate cover I send you my paper on the splash-cup dissemination in plants. This was, of course, Buller's last idea and I have but acted as his steward in bringing it out. I sincerely believe that it is my best contribution to date and I hope you can

find a minute to read it even if not the other papers. Julian Huxley remarked, when I had revealed the story to him: "Wouldn't Darwin have loved that." Edgar Anderson wrote me a nice note in which he stated that my paper was "one of the most intellectually and aesthetically appealing" things he had seen in a long time.

Helen continues to grow in musical stature as well as growing more attractive every day. She gives a very substantial recital quite often and I enclose her most recent program. The critics were high in their praise, which was indeed merited. Helen had an offer from a New York impressario of a tour in the East but she felt she did not want to leave the children for too long and doubted whether her strength is adequate for concertizing.

Anne plays the violin very creditably for a twelve-year old: she has progressed to Corelli sonatas which she and Helen enjoy doing together. Phyllis is learning piano and also doing well. What is more important, both children love their music.

Since I first heard about Oenothera from you, I enclose a bit of verse that came into my head in place of original ideas. Throw it out when you have read it.

We all hope this finds you well and happy. Any time you care to write we shall be delighted to hear from our dear Uncle Harley to whom, meanwhile, we all send our warmest greetings.

Ever sincerely yours,

Harold

## THE DEATH OF FRANCIS W. PENNELL

We have just received word of the death of Francis Whittier Pennell, which occurred on February 3, 1952. For many years Dr. Pennell's name has been synonymous with research on the family Scrophulariaceae, and his passing deprives the botanical world not only of a kindly friend but also of a scholar of the first rank.

Francis Pennell was born of Quaker stock in Wawa, Pennsylvania, on August 4, 1886. He completed his formal botanical education at the University of Pennsylvania in 1913, and after a period as Associate Curator at the New York Botanical Garden he became in 1921 Curator of Plants at the Academy of Natural Sciences of Philadelphia, where he remained until his death.

In addition to his work on Scrophulariaceae Dr. Pennell was widely known for his researches on historical figures in American botany. He traveled widely in the New World in pursuit of his chosen study of the Scrophulariaceae, and took part in many expeditions to Mexico and South America. — R. McV.

# THE GENUS TRAGOPOGON IN MICHIGAN

Paul W. Thompson

Cranbrook Institute of Science

GOAT'S-BEARD, a name applied to species of Tragopogon, natives of Europe, is now common in Michigan as well as many other parts of the United States. Like most other Compositae, it bears a flower head which superficially resembles that of the sunflower and a seed head which looks like that of gigantic dandelion. It grows several feet high, has long, narrow, leaves and a long fleshy taproot, which is edible. Because of the flavor of the root, Tragopogon is commonly known as the oyster plant. A white milky juice quickly oozes from the plant whenever a break is made in the epidermis. Since the plant is a biennial, it produces only a rosette of leaves the first year.

Like the dandelion, it blooms profusely in the spring for several weeks and then produces scattered blooms throughout the summer. The flower heads open and close daily. The length of the period that the flowers are open varies with the temperature and the amount of sunlight. Normally, following warm nights, the flower heads open about six or seven o'clock in the morning; and, if the day is sunny, begin to close by nine or ten o'clock. During cooler weather the flowers open slowly; and if the day is cloudy, they remain open several hours longer than the normal period. Because of the timing of the diurnal opening and closing, this plant has been called "Johnny-go-to-bed-at-noon".

Three species of Tragopogon commonly occur in Michigan: — one with purple flowers, Tragopogon porrifolius L.; another with orange-yellow flowers, Tragopogon pratensis L.; and a third, Tragopogon dubius Scop., with pale yellow flowers. The latter has also been designated as Tragopogon major Jacq. Since Gray's new Manual of Botany (seventh edition) described only the first two species, many specimens of Tragopogon dubius in the past have been incorrectly identified as Tragopogon pratensis because of the yellow flowers.

In addition to the color of the flowers, several other characters may be used in distinguishing the species. The leaf tips are curled only in Tragopogon pratensis, but specimens which grow in open shade show less curling. The corolla tips are truncate and the involucral bracts, which have violet margins, are short, rarely exceeding the corollas. The plant itself is yellow-green in color. In

Tragopogon pratensis the peduncle, just below the flower head, flares abruptly upward and outward, whereas, in both Tragopogon dubius and Tragopogon porrifolius the peduncle is flared gradually and therefore appears club-shaped.

The corolla tips are oval in Tragopogon dubius and lanceolate in Tragopogon porrifolius, and in both species the involucral bracts are appreciably longer than the corollas. Although the leaf tips are straight in both species, the leaves are quite strict in Tragopogon porrifolius and the plant is glabrous and glaucous. On the contrary the longer leaves of Tragopogon dubius are bent slightly downward; the numerous leaves at the base give the plant a more bushy appearance, and when young the plant has a flocculent pubescence which is often removed by weathering.

The seed heads of the three species differ in several characteristics, but the most pronounced difference is in the length of the stipe connecting the pappus to the achene. The stipe is less than 1.0 cm. in Tragopogon pratensis, greater than 2.0 cm. in Tragopogon porrifolius, and intermediate (1.4 - 1.7 cm.) in Tragopogon dubius. The large, full heads are quite fertile and contain 50 to 150 seeds.

The two yellow-flowered species of Tragopogon are more widely distributed throughout Michigan than Tragopogon porrifolius. However, the latter often occurs very abundantly locally. All three grow along roadsides and in open fields where they often thrive in colonies by the thousands. Tragopogon dubius is more abundant on the sandy plains of old glacial lake beds than Tragopogon pratensis, which often occurs in partial shade.

When two or three species of Tragopogon grow together locally, hybrids[1] are likely to occur. The abundance of hybrids depends on the numbers of the individual plants, the density of the population, and the relative proportions of the individual species in the population. Thrips and small flies are an important factor in the pollination of the flowers. Hybrids arising from Tragopogon porrifolius can be detected by the maroon or purple coloration of the flowers which occur in a variety of shades such as maroon, red-maroon, yellow-maroon, purple-maroon, grayed-maroon, peach, and pale-grayed-lilac. Many of these hybrids have a yellow coloration at the base of the purplish corolla; a character which is very useful in detecting hybrids between Tragopogon porrifolius and a yellow flowered species.

[1]Hybrids of Tragopogon were discussed in a paper "Observations on Tragopogon in Michigan," presented by the author to the Botanical Section of the Michigan Academy of Science, Arts and Letters at Wayne University, Detroit, April 2, 1949.

Hybrids of the two yellow-flowered species are not as conspicuous because the color of their flowers is intermediate between that of the parents. One type can be distinguished by the extraordinary appearance of the flower head which possesses the long bracts of Tragopogon dubius and the short truncate ligules or corollas and curly leaf tips of Tragopogon pratensis. The peduncle, however, with its gradual flaring resembles that of Tragopogon dubius. Similar long-bracted, short-corolla types are found with purple flowers or various shades of maroon. In these and many of the other hybrids, the seed heads do not develop well and only a few seeds are formed.

In the Chicago region a long-bracted type was discovered, having very pale-yellow, almost white, flowers. These, however, produced full heads with many mature seeds. Their fertility was demonstrated by the occurrence of colonies consisting of many such plants. Another interesting plant is one resembling Tragopogon porrifolius except for the pale-lilac color of the flowers. This plant also produces large fertile seed heads and frequently is found in large colonies.

The diploid number of chromosomes in Tragopogon is twelve. Marion Ownbey[2] has found in Washington and Idaho several colonies which are amphidiploids.

Because of the large number of interesting hybrid types found in southeastern Michigan, studies have been made on Tragopogon for the past several years. Data have been collected in the field both from colonies containing only two of the three species of Tragopogon and from mixed colonies in which all three species occur. Seed heads have been collected, and the percent germination of the seeds has been determined. Also plants have been grown from seeds at the University of Michigan Botanical Gardens and the characters of these plants have been studied under the guidance of Professor H. H. Bartlett. Although this work is not yet completed there appear to be in mixed colonies three normal $F_1$ hybrids which possess more or less constant characteristics and a variety of backcrosses which result in a large number of hybrid types having a wide assortment of character recombinations.

Also, preliminary studies have been made on glacial acetic acid extracts of the flowers of various hybrids. Spectrophotometric curves on these extracts suggest that the color of such solutions may possibly be correlated with the type of hybrid.

# YUNNAN, THE BOTANICAL WONDERLAND

Ying-Pe Chang

When the gusts are delighted at my discussions of all unreality,
the blossoms seem to smile;
While the monks are listening to my preaching of the doctrine,
the birds warble confusingly outside.

Scroll inscription by Mu Tseng of Yunnan, A.D. 1587 - 1646
Translated by J. F. Rock, 1947

IN RECENT few years, I have spent most of the time operating the microtome and timber testing machines. My adventures seem to be limited to the microfield. Such tedious work sometimes makes a nature lover dream about his past. I like to travel in the wild and enjoy the real beauty of scenic spots. When I was a high school boy, I lived in Peiping, one of the world-famous cities for its pleasant landscapes. Four intimate schoolmates and I wrote a self-printed magazine simply for recording our inspirations from nature. To search for material which would give our souls some new wisdom, we used to make special trips to lovely spots or took walks particularily in the raining or snowing days. Our greatly loved publication, although actually very few persons were interested to read it, lasted about 10 issues, until we had no more funds from our allowances to maintain it. I have been keeping the spirit of it and have had many opportunities to meet with nature since high-school days; but my unstable life after the last war does not allow me to be gay and sometimes I even try to forget all about the past. However, my adventure in Yunnan is one of those things that would never be forgotten. The following short account of Yunnan is somewhat from the viewpoint of Botany rather than a general naturalist's impressions. Most of the information is based upon the work done by the staff members of Fan Memorial Institute of Biology and my own experience. It is hoped that specialists in Botany will imagine how wonderful Yunnan is according to whatever idea each may have about what gives him inspiration.

Yunnan, an extreme southwestern province of China proper, is bounded by Burma on the west and Indo-China on the south. It is a very beautiful mountainous country with an area approximately 146,680 square miles. Its northwestern portion is situated on the foot of Tibet plateau sloping from an altitude of more than 15,000 feet down to the southern lowland of about 1,000 feet. Its southern

part, about one fourth of the total Yunnan area, lies south of the Tropic of Cancer. There are quite a number of big rivers such as the upper Irawadi, Salween, Mekong and Red River running southward to Burma and Indo-China; the Chin-Sha River (to the Yungtze) and Nan-Pan River eastward. The climate of different regions in this province is, therefore, variable according to the latitudinal position and elevation. Besides, Yunnan has generally alternate dry and rainy seasons because of the influence of the monsoon. The rainy season from May to October usually has more than 80% of the annual rainfall. Naturally, a very complex vegetation comes with such complicated topography and climate. A plant ecologist will not be surprised to find almost every inland type of vegetation and their mixtures in this province.

The floristic composition in Yunnan is rich and interesting too. Basing his conclusions upon the geological history of south Asia and the knowledge of Chinese flora, especially the more than 6,000 authentically determined species and varieties of flowering plants in Yunnan, Dr. H. H. Hu, Director of Fan Memorial Institute of Biology and Ex-President of the National Chung-Cheng University, has analysed the Yunnan flora. Eight important phytogeographical elements are distinguished by him, in addition to a group which is widely distributed. Being one of his former assistants, I had the opportunity to observe his work and help in the statistical routine. The elements as he defined them and their percentages in the total of known flowering plants in Yunnan are summarized briefly as follows: 1. Palaearctic and Circumpolar, 2.5%. These elements have been well defined and many of them are familiar to European and American botanists. 2. Central Asiatic elements, 1.4%. This is a small but significant proportion of the flora originally known in Mongolia, Turkestan, Tibet, N. W. India, Persia, and Afghanistan. 3. Himalayan elements, 10.6%. This is strictly limited to the typical Himalayan elements and excludes some species or genera of the so called "Sino-Himalayan" flora. The important genera are Rhododendron, Primula, Gentiana, Meconopsis, Impatiens, etc. 4. Indo-Malayan elements, 18.1%. This group includes the typical Indo-Malayan flora, extending to Java and the Philippines. 5. Northern Chinese elements, 1.6%. This group is mostly distributed in temperate Yunnan. 6. Southeastern Chinese elements, 5.1%. Some representatives may extend to Japan. Certain species indicate the very interesting floristic relationships of southeastern China and Formosa to Yunnan, such as Taiwania cryptomerioides (recently also found in Upper Burma), Fokienia Hodgsonii (F. Kawaii Hayata), and Amentotaxus argotaenia.
7. Western Chinese elements, 31.5%, confined to those species and genera which are commonly found in western China but not in Himalaya. 8. Endemic elements, 27.2%. Although some genera in

this group are common to other elements, many endemic species and genera are definitely late-developed endemics. For example, Smithiodendron artocarpioideum Hu is not only a representative of a new genus but also of a distinct tribe of Moraceae. 9. The widely distributed plants, 2.1%, include the cosmopolitan, pantropic and widely distributed plants in Asia.

Since 1933, the Fan Memorial Institute of Biology has conducted very extensive exploration in Yunnan and a considerable number of Chinese botanists have been investigating the local plants in field, experimental stations, and laboratories; but our knowledge of Yunnan plants still seems very meager. A brief history of botanical exploration in Yunnan may be summarized here. Although British collectors really started botanical study in China in the early nineteenth century, in collaboration with the Royal Botanical Gardens, they entered Yunnan rather late. Dr. Augustine Henry went to Mengtze and then to Szemao, south Yunnan, in 1896. He made some collections. If he could have gone a little more southward, he would have had a much better opportunity. The most successful British botanical collector in Yunnan was George Forrest. He made seven expeditions from 1904 to 1932. He collected a huge number both of herbarium specimens and seeds of garden favorites. He spent the most time in northwestern Yunnan, one of the local hunting paradises. He died by illness during his last trip and his tomb is still in the place surrounded by the world-famous magnificent flora which he loved. Another well known British geobotanist especially to be mentioned is Frank Kingdon Ward. He defined the "Sino-Himalayan flora" and has been working in its region ever since 1911. He started his work from northwestern Yunnan and traveled in many parts of Assam, Sikkim, Tibet, Sikang, Yunnan, and once down to Indo-China and India. At the end of the last war, he was still at work somewhere near Tibet. He seems never to have tired.

The French missionaries in Yunnan also contributed botanical collections in the early days. Among them Père Jean Marie Delavay was undoubtedly the most important one. He stayed ten years in the mountain area between Talifu and Lichiang from about 1880. He used to collect the same kind of plants in different seasons. His collection was mostly studied by M. A. Franchet. Père Francois Ducloux spent most of his time in Kunming, then better known as Yunnanfu, the capital of Yunnan. Although his special hobby became ferns, he collected a considerable number of local woody species. There are several kinds of beautiful tall trees around Kunming which bear his name, such as Cupressus Duclouxiana, Catalpa Duclouxii, Machilus yunnanensis var. Duclouxiana, etc.

The most important European collector in Yunnan other than the British and French was Handel-Mazzetti of Austria. He worked mostly in north and northwestern Yunnan. He was not only a successful collector but also studied most of his collections himself, since he was a famous plant taxonomist and one of the old hands in Chinese phytogeography.

Among the famous American horticulturists and botanists who have worked in China, Joseph F. Rock is the most important for the Yunnan region. After his searching for Taraktogenos Kurzii in Burma, Assam, and Siam in 1920, he spent most of his time intermittently in northwestern Yunnan until the last war. His achievement is not confined to botanical and zoological collecting but also extends to ethnobotany and ethnology. He has learned Chinese rather thoroughly. His recent publication, "The ancient Na-Khi Kingdom of Southwest China" in two big volumes, discloses a very interesting story of the aborigines and the local flora.

Among Chinese collectors in Yunnan, those of the Fan Memorial Institute of Biology did the pioneer work and its assistants have explored almost the whole province. Messrs. H. T. Tsai, C. W. Wang, and T. T. Yu have been the most successful field workers. Tsai and Wang mainly explored in southern Yunnan and some other regions. Wang is specially interested in plant ecology and now is doing research work in Harvard University. Mr. Yu spent most time in northwestern and western Yunnan. A couple of years ago he was studying in Edinburgh. From the snow mountains down to the malaria-ridden jungles, five to ten thousand numbers of specimens are commonly collected each year and as a rule ten specimens to each number. Amazing new discoveries and many new records of distribution have added to the Yunnan flora, including many from areas repeatedly traversed by western botanists. I entered the Fan Memorial Institute and went to Yunnan much later than my colleagues mentioned above. My collection in Yunnan is smaller than theirs, amounting to some three thousand numbers, but with authentic wood samples of many, and, as everyone knows who does it, the collecting of supplementary material for anatomical or morphological study makes the collector's work vastly more time-consuming.

I went to Yunnan via Indo-China in August 1940, by the old French railway which was then unconnected with the Chinese system, but has since been united. It was the first time in my life that I had seen tropical scenery and tasted of freshly picked tropical fruits. I stayed in Indo-China about two weeks. The local plants were outlandishly strange to me and the vivid first impressions of their forms were quite different from my conceptions of them derived from the dry herbarium specimens. From the

border of Indo-China, the railroad passes through winding gorges and climbs gradually up to its terminal, Kunming, the capital of Yunnan, where the elevation is about 6,000 feet above sea level. The landscape changes all the way as the train passes from the tropics to a comfortable temperate climate. The first year in Yunnan I was lodged in a temple in the place called Black Dragon Pool near Kunming, where the temporary office of the war-time Yunnan Botanical Institute was housed. It is one of the famous and big temples built about one thousand years ago. I remember that I did not sleep too well the first night. I was not scared by ghosts but over-enjoyed myself by listening to the symphony composed of the murmur of a tiny stream from the very near-by spring and the breeze whispering in the trees. There are many fish in the Black Dragon Pool which are revered as sacred dragons, and cannot be caught without the catcher running grave danger. The dragon family and officers stay in the pool. Fish that leave show by so doing that they do not belong to the dragon community, so it is safe to catch and eat them. There is no law to protect the fish in the pond, and no police, but the fish in the pond are quite safe. The cause of conservation is served by such a useful popular belief as this, even if we think it is just a superstition.

My main aim in going to Yunnan was to study the local woods and their properties. Under the auspices of the Yunnan Botanical Institute and the National Engineering Research Institute, Academia Sinica, my study was carried on rather smoothly. To start my work from the very beginning, I should collect the material myself. For this reason, my collections in Yunnan are mostly accompanied by wood specimens. Some of them were cut from big logs and some from 4 ft. blocks. Because of difficulty of log transporting in the mountainous country, my collecting routes were much shorter than those of my colleagues. Nevertheless, I have traveled over quite an area in Yunnan. My herbarium specimens were mostly determined by Dr. W. C. Cheng, Assistant Director of Yunnan Botanical Institute and one of the Chinese famous dendrologists.

Among the romances of my collecting, a few events may be mentioned. My first collection was in northeastern Yunnan. While I was getting leave and after I had reached the goal my directors and colleagues were warned about the safety of this unexperienced collector in such topographically complex territory. Coincidentally, after a few days climbing over countless slopes, I went right into a high mountain and got lost. That unhappy event, however, gave me unexpected plant-hunting fortune. It was Mt. Wu-Mong, about 14,000 feet above sea level, isolated in the border between Szechuan and Yunnan. I remember the day when we just found ourselves lost in an unknown area. We were forced to camp on an

Fig. 1. Abies Georgii var. wumongensis Hu & Cheng. (Type locality.) The fir was grotesquely shaped by the wind on the top of Mt. Wu-Mong, alt. 14,000 ft. (A small branch is shown in Fig. 5.) The lake is surrounded by the rhododendron thickets as shown in the foreground.

Fig. 2. An undescribed Gentiana on Mt. Wu-Mong.

open slope. The whole group, including my aid and 20 laborers, were all tired. The flames from the big camp fire did not warm us. On that quite gigantic mountain I realized how unimportant a human individual is. I was wondering whether a person should try to escape, like Rip van Winkle, or struggle for one's valuable short life-span? The chilly mountain wind did not blow my conscience clear enough to solve this puzzle. When morning dawned I found that we were near a graceful lake surrounded by rhododendrons and the glorious gentians. Approaching this vividly beautiful scene led me later to the road. The inspiration from this experience naturally constructed the frame of my poem which I wrote here and sent to my fiancée a thousand miles away. One year after, she came to Yunnan to share my experiences and feelings, and we got married.

On this trip, I found a new variety of fir, Abies Georgei var. wumongensis Hu & Cheng, which forms virgin forests in that area.

Fig. 3. Abies Georgii var. wumongensis Hu & Cheng.· (Isotype before drying.)

Fig. 4. A new juniper (Juniperus Changii Hu & Cheng) collected on Wu-Mong Mountain.

It is shown in Figures 1 and 3. A new juniper, Juniperus Changii Hu & Cheng (Fig. 4) was obtained from the same locality. It is a dwarf less than the height of a man, with very dense foliage.

I presumed that lovely gentian to be a new species but did not describe it. It is shown in Figure 2. There are about 90 species of Gentiana in Yunnan. I started to monograph them and detected several undescribed species, but never published them. Some were curious little climbing plants resembling Crawfurdia in aspect. I devoted a year mostly to Gentiana and sent the notes and material to Mr. Yu, who took them to Edinburgh. I do not know what came of the project.

On our way back, this time along the right path, I spent several days in a bamboo area, at about 9,000 ft. above sea level. The bamboo thicket, formed by Arundinaria sp., about 10 feet high, runs for miles. It is the main material used for making wrapping papers to supply the Kunming market. Figure 5 has been drawn by Mrs. Peter Hill from a rather poor photograph of the primitive little paper factory. In the middle background is the pile of bamboo

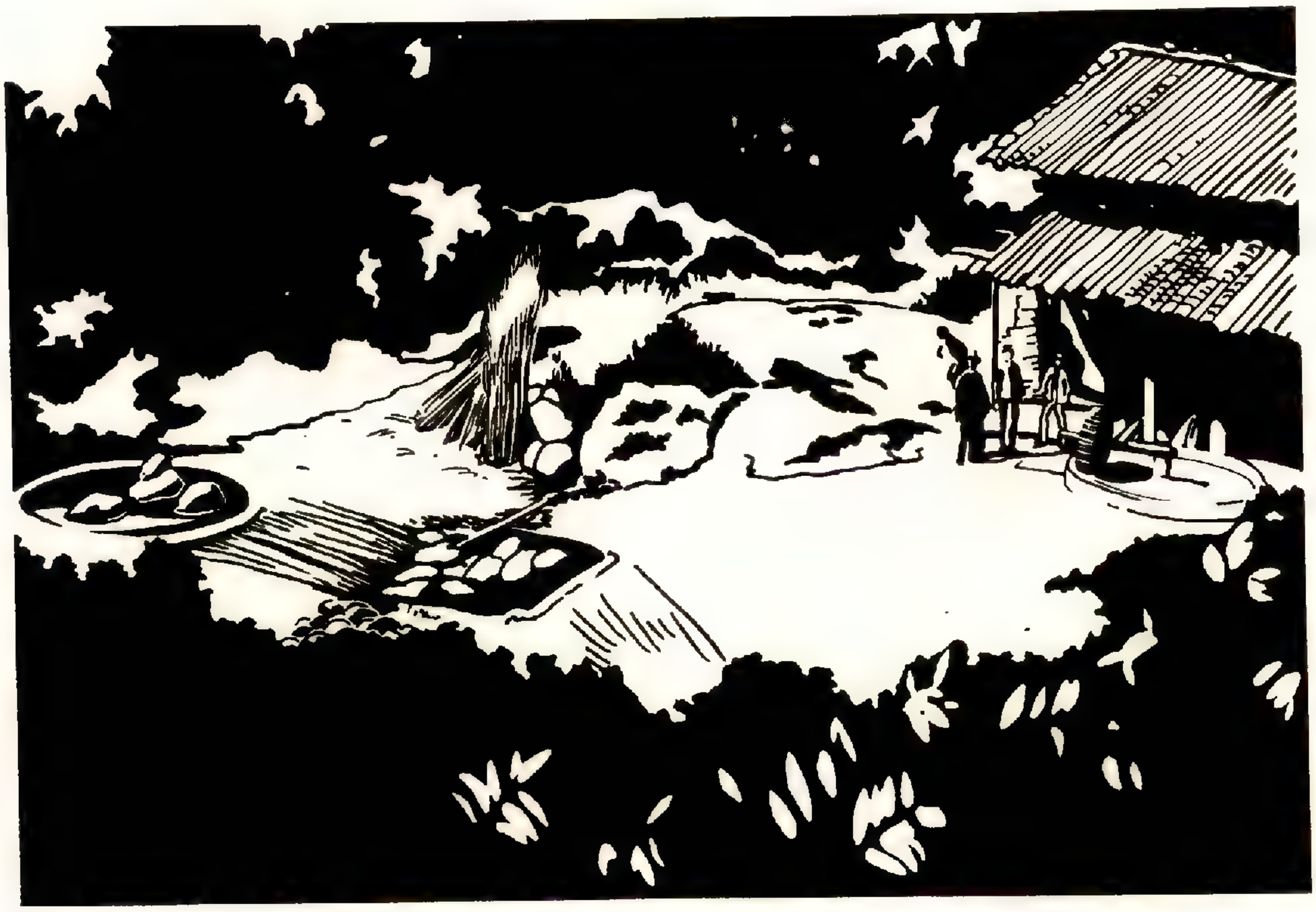

Fig. 5. The mill where Arundinaria is used to make paper.

used as raw material. The round basin on the left is used for soaking the bamboo in alkali solution to soften it. The process is continued by rinsing out the alkali in the square basin nearer the middle. The irregular objects are stone weights used to keep the bundles of bamboo submerged. Under the shed at the right is another circular area in which a stone wheel attached to an upright central pivot is pulled around and around by a horse to reduce the treated bamboo to pulp. The pulp was then thrown onto screens, but the shed in which it was done was so dark that my photographs were not successful. This was the only factory for making bamboo paper that I saw in Yunnan. Maybe it was then the only one. I was a guest in the owner's house, and while I was there he held a ceremony for the wedding of one of his family during which he kept open-house with continuous banqueting for all comers during three days.

Not far from that place, I collected an edible green alga. It is rather abundant in the running stream of a sloping valley. I ate a lot of it raw and fried, on bean cake, and it tasted rather good. The specimen was especially made to be sent to my friend Dr. Chin-Chih Jao, a graduate from the Botany Department, University of Michigan, for identification. He published it as a new species, Prasiola yunnanica. After a couple of months, I returned triumphally to our headquarters with 40 horses loaded with specimens and a pair of crippled legs, — because I did not dare to ride a horse in the steep mountains, and walked all the way. On the way we passed a medium-sized tree in which a big snake was coiled. It was big even compared with the branches of such a tree. We did not molest it, nor did it pay us any attention.

Among my other collecting trips, I would like to mention the following one in concluding. In 1943, I traveled west along the Yunnan-Burma Highway searching for bridge-construction timbers. This work was in cooperation with the U. S. Army Engineers, S. O. S. The higher authorities requested the district engineers to give me all possible facilities. Being modernized as a jeep rider, I could enlarge my daily acting area. I passed the Mekong River and stopped at the east bank of the Salween River. One of the engineers, Capt. Elliot, is a garden lover. We became friends very quickly. I spent about a week in his district. Whenever we were together in the field for lunch, we used to choose the place having abundant tall lilies as natural table flowers. The flowers are white, big, and extraordinarily fragrant. He collected some bulbs of lilies and other plants to be sent back to this country. From this trip, I got a better chance to learn the local plants. As I can recall, the timber specimens other than pines and oaks were collected from the following species and genera: Taiwania cryptomerioides, Phoebe, Ficus, Bischofia javanica, Acer, Diospyros,

Dalbergia, etc. A new species, Schima yunnanensis Au & Chang, was obtained. It is one of the valuable local hard woods.

Yunnan is not only an ideal place for field work, for its rich flora also provides much interesting material for laboratory studies along different lines in botany. Naturally, those plants attract especial attention which have great potential economic value. There are several different types of forest which are mostly still in the virgin state. We can find coniferous forest mainly of fir-association in the higher mountains; pine-oak mixture in the greater part of the table-land of middle Yunnan ever-green oak-laurel association in the warmer places; and down to the south the tropical rain forest with such dominant genera as Canarium, Cedrela, Terminalia, Ficus, etc. Some giant bamboos, tree ferns, lianas, and epiphytes also flourish in this region. In certain parts of Yunnan, the ever-green oak forests run unbroken for a hundred miles and there are localities where the big coniferous trees are commonly over two thousand years old. When I studied the mechanical properties of the commercial timbers of Yunnan, I was very much pleased to find that their strength suits them admirably for constructural purposes.

Fig. 6. Forest of Pinus yunanensis Fr. in the vicinity of Kunming, showing this pine in the foreground and a deciduous oak, Quercus variabilis Bl., in the background. Note the twisted trunk of the large pine on the left. In some places all or most of the trees are twisted, and such evidence as we have seems to indicate that the feature is hereditary rather than environmental. Pinus yunnanensis is indigenous to southwestern China and a predominant pine in Yunnan, where it appears often in pure stand or mixed with Pinus Armandi, Keteleeria Evelyniana, and oaks.

Besides the importance of Yunnan for systematic, phytogeographic and economic botany, it is an ideal place to study two other related subjects. The first is ethnobotany. There are many different ethnic groups. More than one hundred tribal names have ever been given to that natural human museum. Although no sufficient anthropometric measurements have been accomplished to classify them into physical types, most authorities have agreed that there are linguistically three main aboriginal families in addition to Chinese. They are the Mon-Khmer, the Shan or Tai, and the Tibeto-Burman family. Each of the above families comprises several distinct groups. These ethnic families have a wide range of distribution, yet they all have their representatives in Yunnan. Searching scientific evidence of cultural origins from ethnobotany, study of these folks will undoubtedly contribute a great deal. They are very nice people if you treat them in a friendly way. The second subject is paleobotany. The preserved remains in Yunnan ought to provide much of paleobotanical interest. Although Yunnan has been an integral part of South Asia since remote geological time, it has been the scene of great geological changes. In the early Miocene period, the Himalayas and Tibet Plateau were raised adjacent to the northwestern Yunnan. Since the dismemberment of Cathaysia, changes in the climate caused great migration and intermixture of different floristic elements. Besides its Cathaysian flora, there might be some fossil evidence of what corresponded chronologically with the Glossopteris flora. Related to the more modern geological story, there is a problem of the source of the "Sino-Himalayan flora". Modern phytogeography should be studied jointly with paleobotany.

Yunnan has been called the Switzerland of China for its beautiful scenery of high plateau; yet you can enjoy tropical romance as well. I was in that wonderland for almost six successive years from 1940. Now I can not help recalling the graceful lake on one of the summits of Wu-Mong mountain, surrounded by big-flowered rhododendrons, and valleys carpeted with primroses and gentians; Kunming, the capital of Yunnan, about Christmas time with the Camellia trees in blossom, their pink and deep red flowers as big as dahlias, and their colorful canopies covering the whole yard of a temple; down to the south, white peacocks crowing in the forest where magnificent orchids hang on the bark of the trees. To get the best from travel, the traveler should be a botanist, and the botanical wonderland is Yunnan.

The Botanical Gardens,
University of Michigan.
November, 1951

# THE LYCHEE AND OTHER CHINESE ECONOMIC PLANTS CULTIVATED IN FLORIDA

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UNDER THE AUSPICES of the Michigan Botanical Gardens, I have had an opportunity to make two trips to Florida for the study and collection of Chinese plants introduced into that state. Although my own special interests are in the lychee (Litchi chinensis Sonn.) and its relatives, I also gave attention to other Chinese subtropical economic plants.

Through the kindness of Professor G. Weidman Groff an itinerary was arranged for the summer of 1950, and again for 1951. I must express my deep gratitude to Professor Groff for the valuable information given by him, and for continued guidance in my Florida work. Professor Groff, formerly Dean of the College of Agriculture, Lingnan University, Kwangtung, China, lived in the Lychee district for more than thirty years. His book entitled "The Lychee and Lungan", published in 1921, is considered the bible of the new lychee industry. Dr. R. H. Marloth, the director of the Subtropical Experiment Station of the Union of South Africa, refers to Groff as the world's leading authority on the lychee. Professor Groff now directs the Lingnan Plant Exchange in Laurel, Florida, and the Christian Service Training Center, of Frostproof, Florida. This latter organization has just been set up in central Florida, by a group including Sam Higginbottom (horticulturist), the former missionary of India; Willis T. Spivey of Babson Park; Frank Dickinson (veterinarian); Richard E. Pride; and G. W. Groff (both are horticulturists). The last three named were all formerly missionaries in China. This organization, zealously devoted to Christian missionary enterprises, is also connected with foreign mission work carried on at Pennsylvania State College.

The aim of the Christian Service Training Center is chiefly to give students who plan to become missionaries a practical agricultural and horticultural background. Last year a group of American students came from Pennsylvania State College, and one Indian student from Michigan State College, East Lansing, Michigan. A big piece of land was selected near Reedy Lake, a large slat house was built by students themselves, and many kinds of tropical and subtropical plants were planted. Thousands of a good variety of pineapple plants have been grown, and various experiments set up on this new plot of land, which are yielding interesting results. The

training at this station will be ideal for urban students who expect to be rural workers in foreign lands.

In the summer of 1950, I arrived at Frostproof a little too late in the season for the harvesting of lychees. Most of the varieties were already picked, with the exception of the late "Mountain Lychee" variety cultivated on the property of Mr. Vissering at Avon Park. The first batch of lychee seeds were sent back to the Botanical Gardens on July 6, to be started for the study of germination, seedling characteristics, and cytology. About 100 seeds were planted at C. S. T. C. farm at various locations, in different soils. Similar plantings were made at the West coast (Laurel) in the Lingnan Plant Exchange garden. The mountain lychee is not good for fruit, but is used as stock for grafting and inarching. It grows well in the Ridge district of Florida.

At the end of July I went over to the west coast of Florida, where the largest commercial plantings of lychees are located. Lychee Orchards, Inc., Laurel, Sarasota County, Florida, is located along the Tamiami Trail (U. S. 41), 4 miles north of Venice, about 14 miles south of Sarasota city, represents one of the first efforts to develop the lychee on a commercial scale in this country. Colonel Wm. R. Grove, the owner, has shown great foresight in visualizing this ancient Chinese fruit as the basis for a profitable agricultural enterprise. I want to express my appreciation to him for giving me the privilege of using his orchard as a working base and also for furnishing me with all the plant specimens which I need for my study.

This orchard occupies about 200 acres, on a small canal running from Sarasota Bay to the Trail. There are 14 flowing wells and about 2 miles of wind-breaks consisting of cajuputi (Melaleuca Leucadendron) trees and Australian pines (Casuarina sp.). More than 50 acres are under intensive cultivation. Besides the lychee trees, there are many varieties of citrus and mango trees in bearing, and a wide variety of other tropical and subtropical fruits, economic trees, and shrubs. A big nursery sells air-layered young lychee trees, and both budded and seedling mangos. There are more than 1000 lychee trees of about ten different varieties in the orchard, about half of which are in bearing. The biggest is 26 years old and yielded 308 pounds of fruits this year. The most popular variety now on the market is the so-called "Brewster" variety which is the "Chen-purple Lychee" of ancient Chinese literature. This is the most famous lychee in Fukien province, especially cultivated intensively in P'u-tien city, formerly called Henghwa. Rev. William N. Brewster, former missionary of the Methodist church in Henghwa district, Foochow, introduced the "Chen-Family-Purple" Lychee into this country between the year 1903 and 1906, under Nos. 10670 to 10673

of the Office of Foreign Seed and Plant Introduction, U. S. Department of Agriculture. Most of the other Canton varieties were introduced into this country by Groff, of which one notable variety, the Hak-ip ("Black Leaf") of the Chinese monograph, yielded fruits for the first time in 1951. Groff introduced Hak-ip in 1918 from Canton, China.

Last December another large lychee plantation was set up in Bradenton, about 32 miles north of Laurel. There the soil of 1000 acres was tested and seemed to be suitable for lychee trees. About 400 acres has already been planted to young lychee trees. This will be the largest lychee plantation in the world. South Africa, India and even China have no planting to compare in size with it. In Canton and Fukien, the lychee belt, small orchards and individual trees are scattered through the villages.

All the young trees in this Bradenton plantation will be secured from "Lychee Orchards, Inc." in Laurel. Like citrus, seedlings of lychee trees cannot be depended upon to reproduce the parent type. Anomalous growth of the cambium layer makes budding and grafting unsuccessful and difficult. The old Chinese air-layering and inarching methods of vegetative propagation are used. For the former an improved plastic wrapper that holds moisture but permits sufficient gas exchange has been very successfully applied. In China now it has been reported that tung-oil paper is being used for the same purpose. I had a chance to practice every step in the process of Chinese air-layered Lychee tree propagation. This method is applicable to many other kinds of plants, not only for fidelity of reproduction but because seedlings may require a longer time to come into bearing. By using this method about 20,000 young lychee trees were produced every year from the nursery. The moisture-holding material within the plastic wrapper is Sphagnum. The bark is ringed at the point of wrapping.

After making studies of the germination of lychee seeds, root-tip chromosome counts, and leaf measurements of different varieties, I made my second trip this spring, 1951, in order to study the polygamo-monoecious flowers during the blooming season, from March to May, as well as the progress of fruit development. Concurrently with the developmental studies, herbarium specimens were being collected of the different varieties, and a key was made for their identification, based upon fruit and leaf characters. There is at present great confusion in the variety records.

Lychee trees now grow at various locations in Florida, ranging from Orlando to Homestead, on both coasts and the "Ridge", as well as in the Everglades and Redlands districts. In China the fruiting

range is limited, up to the northern part of Foochow, not over 26° N. latitude according to former records, and southward to Kwangtung and Hainan in a rather limited area. In Florida, it is said that the section from about Haines City to Lake Placid is considered suitable. Two of the biggest and oldest lychee trees in this region of Florida usually produce up to 300 or 400 pounds or more each of fine quality fruit. This section is fairly free from heavy freezes, yet has sufficient cold weather to insure a dormant period. Several good locations have been tested out on the West coast and a few on the East coast. The northern limits of the lychee tree in Florida have not been definitely established, and can only be determined by experience. The climatic and edaphic conditions of South Florida correspond to the southeastern Chinese provinces of Kwangtung and Fukien, where the tree grows vigorously and fruits well.

I had the opportunity to visit some of the big lychee trees grown in different sections of Florida. Accompanying Professor and Mrs. Groff, I went to the Subtropical Fruit Station of the U. S. Department of Agriculture at Orlando. Dr. Frank E. Gardner and Dr. Reece showed us all the lychee trees. Specimens were secured in order to compare with supposedly the same varieties grown in Laurel. On the way back to Laurel we visited Babson Park, Avon Park, and DeSoto City. Mr. C. R. Tyson at DeSoto has one of the oldest trees, 40 feet high and 48 feet wide in spread, planted in his garden. Acres of young trees have been newly planted near the water. A few hundred pounds of fruit also are produced every year from the big tree.

At the University of Miami, Coral Gables, Mr. and Mrs. Morton, directors of the Morton Collectanea, kindly showed me around the campus, especially to Dr. Swingle's library. Dr. Walter M. Buswell showed me different specimens of Sapindaceae in the Buswell Herbarium and very generously shared with me some of his valuable material. In Miami, accompanied by Mrs. Julia F. Morton and Mr. Charles H. Steffani, Jr., son of the Dade County Agricultural Agent, I went to the U. S. Plant Introduction Garden, Chapman Field. Mr. Harold Loomis, in charge, provided information on introduced plants from the office card files and guided us to plants of interest, from which specimens were secured. At the University of Florida Subtropical Experiment Station, Homestead, we met Dr. Ruehle (in charge) and Mr. Milton Cobin, the horticulturist. On the way we also visited Palm Lodge Tropical Grove, Homestead, owned by Mr. A. R. Caves. Some akee (Blighia sapida) fruit specimens were secured from Mr. and Mrs. Rudolph Gossman.

The Lingnan Plant Exchange occupies a piece of land of few acres which is located next to the Lychee Orchards in Laurel. It is operated under the auspices of Pennsylvania State College and formerly also

the College of Agriculture, Lingnan University, Kwangtung, China. Besides exchanging good strains or varieties of economic plants among different countries, a prime objective has been to subject introductions to experimental tests. Recently an Indian method of making compost has been greatly emphasized in this garden. Among the many kinds of introduced tropical and subtropical plants, Eleocharis dulcis, the matai of China (Chinese water-chestnut), has received great consideration for field crop production upon the wide areas of Florida's low wet lands. The "Chinese water-chestnuts" are aquatic plants of economic importance. The part used is the corm, which reaches a diameter of about 4 cm. This plant is used by the Chinese both for food and medicine and has become familiar to many Americans who like to eat at Chinese restaurants. The species has been successfully introduced from China, and since 1934 has been experimentally tested, but it has not yet attained commercial production in this country. Commercial ginger (Zingiber officinalis) and ramie (Boehmeria nivea) are other introductions from the Orient which have prospect of success and usefulness.

The cultivation of Chinese plants, such as citrus varieties and the lychee, should become increasingly important in this country. Conversely America has plant resources that will be valuable to China. Through international plant exchange, it is hoped that cooperation and friendship may be continued and that common botanical and agronomic interests will eventually do their share in maintaining world peace for the benefit of mankind!

Litchi chinensis. Horticultural variety "Hak-ip" (Black-leaf). Laurel, Florida, July 7, 1951.

# EXPERIENCES OF SCIENTIFIC EXPLORATION IN THE ALEUTIAN ISLANDS

Theodore P. Bank, II

## OUR BERING SEA FRONTIER

AMERICANS learned with dismay during the last war that the Japanese, knowing little about the Aleutian Islands, knew far more than we. Japanese knowledge came from expeditions, ostensibly to collect plants, in the 1930's, and from numerous casual visits by Japanese "fishing" boats, but even as late as 1942 Americans had paid far too little attention to our frontier on the Bering Sea.

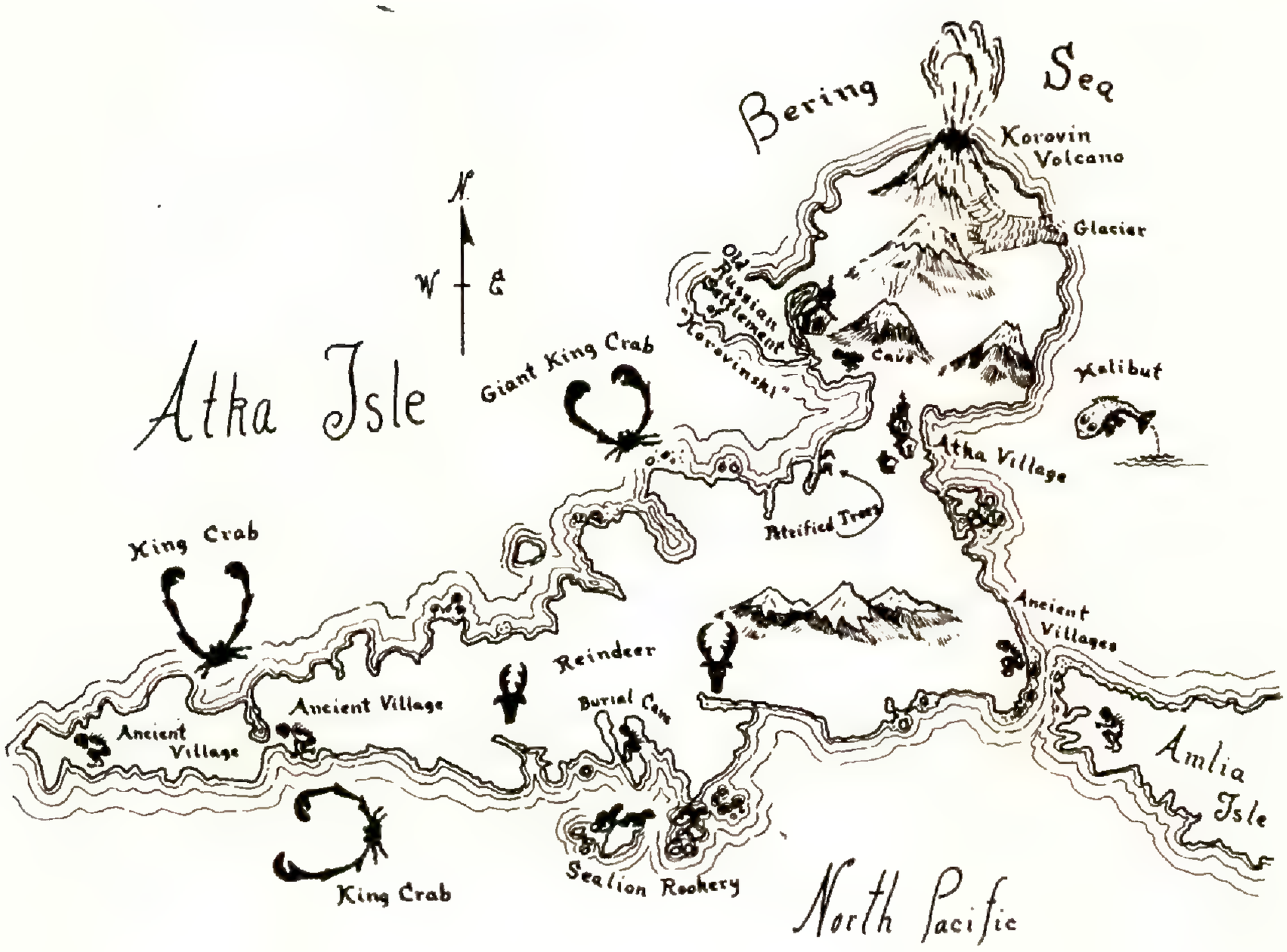
During the decades from 1741 to 1867, before Russia sold the Aleutians to the United States, as part of Alaska, Russian, English and Danish explorers sailed cautiously among the reefs and islands, to chart them, exploit their furs and fish, and alternately to study and plunder their native people.

Dr. Eric Hultén, the Swedish botanist, explored on some of the larger islands in 1932. His collections and studies here and elsewhere in the Bering Sea region, led him to far-reaching hypotheses concerning the origins and dispersal of plants in the Arctic and Subarctic.

During the summers of 1936 - 38 Dr. Aleš Hrdlička, physical anthropologist of the Smithsonian Institution and doughty veteran of archeological field work, landed on many of the islands to seek out burial caves, prehistoric villages and remains of the oldest human inhabitants. Yet, because of the obstacles of weather and terrain in the Aleutians, until the last war scientific exploration had not completely covered the region. In 1951 there are still large stretches of the southern coastlines of the islands which are indicated on available charts only as dotted lines, — unexplored.

These islands stretch in an upcurved arc for 1200 miles from the tip of the Alaska Peninsula almost to Asia. There are 12 large islands and over 50 smaller ones, with hundreds of tiny offshore rocks, islets and pinnacles. They are volcanic islands, born of undersea eruption, and even today there are more than 25 active volcanos along the Chain.

Rocky, mountainous (except for some of the western islands, which are plateaus) and universally fringed with sharp basaltic reefs, the Aleutians seem, at first sight, almost barren of life. But inhabiting them and nesting on the steep cliffs wherever there




is a projecting ledge are countless sea birds, — murres, puffins, cormorants, gulls. Along the shores are sparrows, eagles and large black ravens. This is one of the most densely populated bird sanctuaries in the world.

Sharing the islands with the birds are hundreds of seal and sea lions. The latter, smelled before being seen, keep for themselves a number of offshore rocks, as rookeries for their harems. The shores and valleys are home for blue and red foxes. Only the wind-swept, snow-covered mountain peaks are nearly barren, but even here occur adventuring, prostrate willows and other hardy plants.

One Aleutian native almost became extinct. The sea otter was greatly prized by fur hunters, and mass slaughter so greatly reduced the numbers that even the Aleuts could go for decades without seeing one. Today, in parts of the Aleutians, the little animal is coming back. It now seems certain that, at least for a while, the sea otter won't join in extinction another Aleutian native, the massive, lumbering sea cow, which, only fifty years after white man first set foot on the islands, was completely annihilated.

The Aleutians seem at times as somber, monochromatic and uninspiring as can possibly be imagined. Then again, they are ablaze with color and splashed with delicate hues from the rocky

beaches, through the broad valley meadows, to the peaks above.

In July the blossoms of the wild pea, ragwort, spring beauty and crowfoot peek out from behind tall stands of Elymus and Calamagrostis along the beaches. The slopes of mountains are alive with white umbels of Heracleum waving above the grasses. And here, too, are found lupines, anemone, black lilies, yarrow, Antennaria, and many other plants, including the purple-flowered monkshood. The stream banks are covered with high-growing ferns and grasses, Rhododendron, Streptopus, orchids and louse-wort. The dry knolls are thickly carpeted with mosses, lichens and heaths, but especially with Empetrum. Delicious berries abound. As one climbs higher, the carpet becomes thinner and threadbare, interspersed with talus areas. Dwarf willows, blue-bells, Saxifrage and stunted anemone give color even to these areas.

The high wind, which sweeps across the upper slopes, con-stantly dries the leaf surfaces so that only the hardiest plants can survive. But survive they do, wherever there is the slightest de-pression, projecting boulder, or any other protection.

## UNIVERSITY OF MICHIGAN ALEUTIAN EXPEDITIONS

The University of Michigan Expeditions to the Aleutians had their inception during the war years, when the writer was an Aerographer's Mate in the Navy on Adak. It wasn't until June 1948 that the first field party of two left Ann Arbor for the Islands. Our aims were primarily to conduct reconnaissance on as many islands as as we could reach. The military cooperated wholeheartedly, which was fortunate, for otherwise scientific work in the Aleutians is al-most impossible.

In subsequent years we received more support, including grants from the Office of Naval Research and the Michigan Memorial Phoenix Project. Additional personnel were added, among them being Janet F. Bank, L. H. Jordal and H. A. Miller of the Botan-ical Gardens, A. C. Spaulding and W. R. Hurt of the Museum of Anthropology of the University of Michigan, and D. S. Mc Clain of Trinity College, Connecticut. Professor H. H. Bartlett was general director of the project, but did not go to the Aleutians.

Our scientific objectives were both botanical and anthropologi-cal. Broadly speaking we were and still are attempting to establish from our intensive field studies a post-glacial chronology for the Aleutians in relation to vegetational and faunal succession, as well as human occupation. This calls for detailed plant collecting on as many islands as can be reached, from broad tundra slopes, high

mountain peaks and even from volcanic craters. Prehistoric village sites and burial caves have been studied for their archaeological remains, and these remains are being dated by the radiocarbon method, using peats and ethnobotanical samples. In order to understand changes which have occurred in the native population, we have studied Aleut culture at first hand as it persists, historically, since 1741, the date of the discovery of the Aleutians by the Russians, and prehistorically, from archeological materials.

During the years that we have explored the Aleutians, we have landed on more than thirty of the islands, ranging from the tip of the Alaska Peninsula to Attu, only 150 miles from the Russian owned Kommandorskis. Some of these were islands seldom before visited by whites, and not infrequently our field work resulted in unwelcomed adventures, most of which could be charged to the uncooperative Aleutian weather.

Once we were making a night voyage between Adak and Tanaga islands aboard the smallest of Aleutian sea craft, an Army barge. This tiny vessel, I am positive, can do anything that a floating cork can do, and this particular night our barge was rearing to the top of each gigantic swell, standing for an instant on its rudder and churning screws, finally to plunge to the bottom of the trough as though it were sounding for new depths. Our indicated full speed ahead was eight knots, but rounding Tanaga Cape we found ourselves steadily blown back toward the East. From ten that night until almost three in the morning we vainly attempted to push around the cape into calmer waters. Finally, worn out from the strain, we gave up the attempt and drifted with the current. By midmorning, a bedraggled boat and crew, we found ourselves almost thirty miles to the eastward of the cape.

Another time we seemed hopelessly lost in dense fog off the southern side of Adak island, drifting past ghostly shapes of rock pinnacles and high cliffs. To make matters worse, a bad storm was due. It was only through sheer luck that a small peninsula of land with an old village site on it was recognized. Swiftly locating ourselves on our chart we raced full speed for Kuluk Bay harbor and reached the dock only a few hours ahead of a terrible storm which lasted for almost a week.

## EXPLORING ANCIENT BURIAL CAVES

A memorable adventure occurred on Kagamil, one of the taboo Islands of the Four Mountains. In former days Aleuts brought their dead to this island to place them in vault-like chambers of warm caves in the still active volcanos. In these caves the bodies

were gradually mummified. Today, the remains of the ancients, insofar as they have not been despoiled by relic hunters and foxes, can still be found appearing much as they must have when buried, with hair, skin, coverings of grass matting, and furs all intact.

Afenogin, an older Aleut of Nikolski village on Umnak, told us of the Kagamil caves. Although fearing to enter such places himself, he nevertheless willingly talked about them, albeit in awed tones, and gave us directions for finding them. At the same time, he warned us seriously of the dangers to be expected if we persisted in our explorations.

"If you touch mummies, will take sick, go blind and soon die. Don't know why, but very bad to look at mummies. Rocks in cave all turn red. Very bad."

Despite the rather widespread native beliefs regarding the caves, archaeologists and others have taken away large collections of Aleut bodies, mummy matting and artifacts of stone, bone and ivory. A sea captain by the name of Henning ransacked the cave we were seeking in 1874. Dr. Aleš Hrdlička and his party of college-student helpers continued collecting in the same cave during the summers of 1936 to 1938 and in addition discovered several more on the same island. We, in 1948, wished to determine if the lowest levels had been excavated and whether or not there were other, as yet undiscovered, caves. Accordingly, arrangements were made for the water voyage from Nikolski village to Kagamil island. The Army provided a power barge, designated as the BSP-3111, and the cook, George Flogg, made the first landing with me.

A preliminary search of the south side of Kagamil, for caves reported by Hrdlička, resulted in finding one that was empty. We then cruised toward the southwestern side of the island, where we located the active steam jet referred to by Hrdlička and later by our Aleut informant, and from that had no difficulty in finding the large cave. The BSP was forced to anchor a mile off shore because of a swiftly running sea through the pass, and as soon as our dory had pushed off from the vessel, the skipper hauled in the anchor, intending to cruise back and forth until two flare signals indicated that we were ready to return to the ship.

The perilous pull through the heavy seas and thick beds of kelp (which were impenetrable unless one man was in the bow of the dory to cut the stipes with a knife) exhausted us. As we neared the rocky, jagged shore we chose a deep water passage between two huge rocks, slowly eased our boat into the channel, stern first, and then rode in on a surge, landing with a resounding crash on a projecting rock. Luckily the rock was round; our boat was not

splintered, although our teeth felt loose in our heads. Not pausing to congratulate ourselves on our luck, we scampered to the reef, slipping and sliding on the slimey, kelp-covered rocks, floundering up to our waists in icy water, and doing considerable damage to our hides. We weren't able to pull the heavy dory upon the rocks, but the next surge of the surf did the job for us.

A slick, narrow ravine led to the cave. The mouth was spectacular. It was a huge, inverted V, approximately thirty feet high and ten feet wide at the base. Huge slabs of fallen rock, driftwood, and debris partially blocked the first ten to fifteen feet of the entrance. The interior was deep and dark, with a rotten, musty smell, exceedingly damp, and with thick, green algal growth on the walls. Semi-rotten wood littered the floor.

Evidence of former visits was plentiful. Newspaper, rotten gunny sacks, and K-ration boxes had been left, presumably by Hrdlička's party, trappers, and perhaps a few curious Coast Guardsmen who had heard of the cave after Hrdlička's visit. The

haphazard manner in which former studies had been carried out was evidenced by the intruded debris, numerous skulls and bones still lying about on the floor in various stages of destruction but nevertheless worth collecting, and overlooked material that was later found to be of considerable value. According to Hrdlička the cave had been thoroughly searched, and all artifacts and skeletal material worthy of study had been removed. This was an exaggeration, to say the least.

Artifacts of ethnobotanical importance were plentiful. Aside from the remains of wooden boat (bidarki) frames, the grass

woven matting we found is both interesting and beautiful. To weave it old Aleut women chose blades of wild rye (Elymus mollis) and sometimes stems of the beach pea (Lathyrus maritimus). After slow drying, the strands were split, by using the finger nails, into fine weaving threads. The mats, many of them large and decorated with straight line designs, required many months to weave, and some of them were so finely prepared that they were watertight. Some of the bodies had been wrapped in several layers of matting and then bound tightly in a sitting position in a sea-lion skin.

Excavation of the cave floor revealed that there were at least three, probably a number more, complete skeletons with associated artifacts. These had been covered over by cave deposition, rotted wood, matting, and later interred bodies.

A long, narrow tunnel in the rear of the cave was discovered to be just wide enough for one man to pull himself through on his stomach. This tunnel, at one time much larger, before earthquakes had partially sealed it, led into another larger room. This pitch-black part of the cavern smelled abominably of rotting organic material and fox droppings. Crammed into various crevices I found a number of pieces of human skull, bone artifacts, some grass matting, and what appeared to be an infant mummy wrapped in a bird feather coat. Another larger mummy bundle was high above on a thin ledge. Attempting to remove it, I dropped it to save myself from falling. Being dry and fragile from age, it broke into a thousand pieces. However, the other material was saved. At one time in this part of the cavern there were other ledges and openings, probably containing mummies and artifacts, which have been blocked by rock falls. Some small cracks along the edge of the wall seemed to widen behind the rock barrier into rooms.

While we were working in the cave, several large rocks fell from the ceiling. We couldn't help thinking of Afenogin's warning about the cave, then and later, when we attempted to leave the island. A sudden storm had come up and our dory was being battered on the rocks below. Dropping everything, we ran across the reef to pull it to safety, by back-breaking effort. There was nothing else to do but to return to the cave and wait out the storm. We could think of no way to let the captain know of our predicament; the fog was so thick we couldn't see ten yards ahead.

Back in the cave with flashlights to see by, we commenced digging in the forward part. While we were uncovering one skeleton, a large rock slab fell from a ledge against my hand, smashing one finger. The pain, the nauseating odor of decomposition and the uncertainty about being able to get away that night, led to

a gloomy suspicion that Afenogin, even with no foundation for his taboos, at least had better sense than we.

After dark (approximately nine p.m.), it appeared that the wind was dying, so we decided to risk a wetting and launch our already badly splintered dory. To push it beyond the sharp edges of the reef we had to wade to our necks in the bitterly cold surf. Finally, with a desperate heave and a leap for the stern, I got the boat into the narrow channel between barnacle-covered rocks. My partner pulled mightily upon his oars and we were off. Again we cut our way through the kelp beds, and finally, by shouts and flash-lights, we attracted the attention of the now frantic skipper on the BSP.

The storm that broke that night ended hope of continuing work in the Kagamil caves that summer, but I was now determined to re-visit the island, certain that more caves were to be found.

The following summer, 1949, a party of us did return. We completed excavation of the large cave and explored other nearby shelters, which Hrdlička had discovered a decade before. In addition, four more caves were found, one of which yielded strange masks carved from cedar, fir and birch. With the masks was a single burial, associated with objects of shell, wood, ivory and basalt.

There are probably still more caves on Kagamil. The entire southwestern side of the island may be honeycombed with them. Further exploration of the Islands of the Four Mountains would yield materials important to an understanding of Aleutian prehistory.

## THE ASCENT OF GREAT SITKIN

Botanical collecting took us in July, 1949, to the top of an Aleutian volcano where we camped within the crater itself. Great Sitkin lies about forty miles east of the military base of Adak. When we announced our intention of climbing the mountain, the commanding officer suggested that my wife and I be joined by three military observers, Captain Fred Bown of the Air Force, Ensign Alvin Cooper and Radioman Robert Krueger of the Navy. The five of us were put ashore on the western side of the island from a Navy landing craft one drizzly, grey morning. Our escort was to return for us in five days.

The climb at first was wet but not steep. We waded through a meadow of tall grasses, Heracleum, Aconitum and various other plants, including orchids. The vegetation was kept constantly soaked by the fog. Although we had planned our climb after several flights around the island, we soon found ourselves faced with an

almost vertical escarpment of ash and rock, slippery with algae. Ropes and petons came out, and slowly we began our ascent, roped together. The first afternoon was spent in reaching the half-way mark on the mountain side, where we made camp and dried out in our blizzard tents and sleeping bags. Outside, a cold, wind-blown drizzle obscured all but the closest landmarks.

The second morning was spent in reconnaissance along the margin of the glacier which extended downward from the crater. Most routes across this ice appeared to be dangerous because of crevasses and unpredictable spots of rotten ice. On the third morning we began the ascent across the ice sheet, again roped together. By noon we were once more in a fog so thick that the end man could scarcely see the lead man. An hour of this sort of traverse was more than enough, so we called a halt. The three others returned to our first camp. Janet and I dug in. Our tent was anchored by burying the guying ropes in the snow and then pouring water around them to freeze them to the ice sheet. We were to spend the next twenty-four hours marooned in our tent while a violent wind and sleet storm raged around us.

We couldn't see for more than twenty feet in any direction so thick was the fog. but we frequently heard above the sound of the wind a loud rumbling and a sound like the cracking of ice. The rumbling later proved to be caused by large boulders, dislodged from the cliffs above us, rolling down the mountain side past our tiny tent.

When finally the storm subsided we saw that we had pitched our tent less than two hundred yards from our goal. The cracking sounds we had heard the previous night came, we discovered, from the crater. It was an eerie sight to behold. The winds had carved the ice into fantastic shapes, which were discolored by gases and dust emerging from crevices. Huge basaltic boulders slowly moved, being forced upward by pressures within the mountain, and jets of steam arose to form an overhanging cloud. The crater was choked with ice and rock. Now and then a quake could be felt.

After hurriedly taking movies and still photographs, we sought to beat the fog which was again blowing up from below. Janet and I scrambled across the ice into the crater to search for plants. Some were found and collected. We also found algal growth in hot springs, and on a windswept rocky ridge above the crater we collected arctic willows, mosses, lichens and several blossoms of a hardy bluebell, Campanula lasiocarpa. All other observations were terminated by the rapidly approaching evening and fog.

Our own adventures on the windy ice sheet were not the only ones experienced on that ascent. Our three friends had some of

their own, as we learned when we met them again at the base camp the following morning. They had attempted to follow their compasses back to camp when they took leave of us almost forty-eight hours before. This proved to be the wrong thing to do, for they went astray. They discovered too late that they were on the wrong slope, one which was steeper and far more dangerous than the one we had ascended. Since the fog was thick and night was upon them, they could only dig themselves into the snow, huddle together and spend a totally miserable night. Their sense of humor wasn't lost, however, for Captain Bown, after five hours during which none of them could sleep for the cold, said gruffly to Krueger, "Krug, will you cut out that shaking; you're keeping me awake."

The following morning was still foggy and windy but the party slipped and slid along the ice sheet to an exposed rocky cliff. This they climbed, and then descended into the valley on the other side. They reached base camp before noon.

Our discomforts on the mountain were at last rewarded with a few hours of bright sunshine. The barren-appearing slope on which our base camp was pitched at once assumed a totally different aspect. Here and there clumps of lupine and anemone were bright with color. Scarlet rhododendrons covered the banks of a rushing glacial stream. And yapping a loud goodby to our party as we began our descent, three indignant little blue fox cubs assumed full ownership of our camp-site and the empty ration boxes we left behind us.

# BOTANIZING IN ORIENTE PROVINCE, CUBA

Roy N. Jervis

"Mucho fango" were the first words of Spanish that I learned when I started botanizing in Oriente province, Cuba. They mean "much mud". My first trip from the U.S. Naval Base at Guantanamo Bay, which was my center of operations for the year 1950 - 51, was to Santiago de Cuba to claim my jeep, which had been shipped from New York. This first trip was an adventure in mud, and a year later, the story was still the same, "much mud".

The road began as a rough, rocky, but passable mountain route rising through the Guasima limestone ridge over to the Yateras River and then crossing westerly over a continuation of the same limestone, finally descending precipitously to the salt flats at Glorieta on Guantanamo Bay. As we bounced into Glorieta, our driver, a friend with two years experience handling a jeep in Cuba, encouraged his three passengers, two other Navy employees and myself, by saying, "the road ahead is a real boulevard."

Boulevard it may have been, — in the spring dry season. But in August the first rains of the fall hurricane season made it a mire of axle-deep mud. I learned then the primary rule of jeep travel in Oriente: "follow the most recent jeep track." Either the driver ahead of you managed to get through, or else he is stuck somewhere ahead of you and needs help. Simple but most effective rule of the road! My only road disasters in the year that followed came from ignoring it.

Through the twisting trail of mud from Glorieta, we began to doubt if the jeep, grinding in lowest gear for a mile, would reach the other side of the flats. Trucks had cut the trail into deep ruts, like small rivers of mud and water criss-crossing endlessly across the flats. To make matters worse, it was dark, — and then we slipped. Our driver had missed a turn, and we were mired. Wading in mud to our knees, we pushed, we shoved, we dug. Finally, with clothes drenched in mud, mud in our hair, mud in our ears, we were rescued by a friendly Jamaican, whose jeep, towing a load of furniture on a trailer, pulled up behind us and provided anchorage for block and tackle. In five minutes we were free. The remaining distance to Guantanamo was over comparatively smooth roads through the cane fields of the valley. At the Guaso River we washed off the worst of the mud, and in Guantanamo City rented a room at the hotel to clean up in before continuing to Santiago.

After crossing a rocky limestone and marble range, we descended again into cane land along the Guantanamo River. Twice again we were mired. Fortunately we had added two more passengers at Guantanamo, crowding the jeep, but five men pushing are better than three. Near Sabonilla we plunged into sticky black gumbo so deep that it began to ooze between the floorboards. Anchoring block and tackle to the nearby railroad track, we pulled the car free. From Sabonilla into Santiago the road improved.

I found my own jeep waiting in a warehouse, and drove without incident back to the Base.

Torrential rains of the hurricane season marooned us on the Base from August until November. Occasionally the jeep was able to navigate the mud as far northeast as the Yateras River and

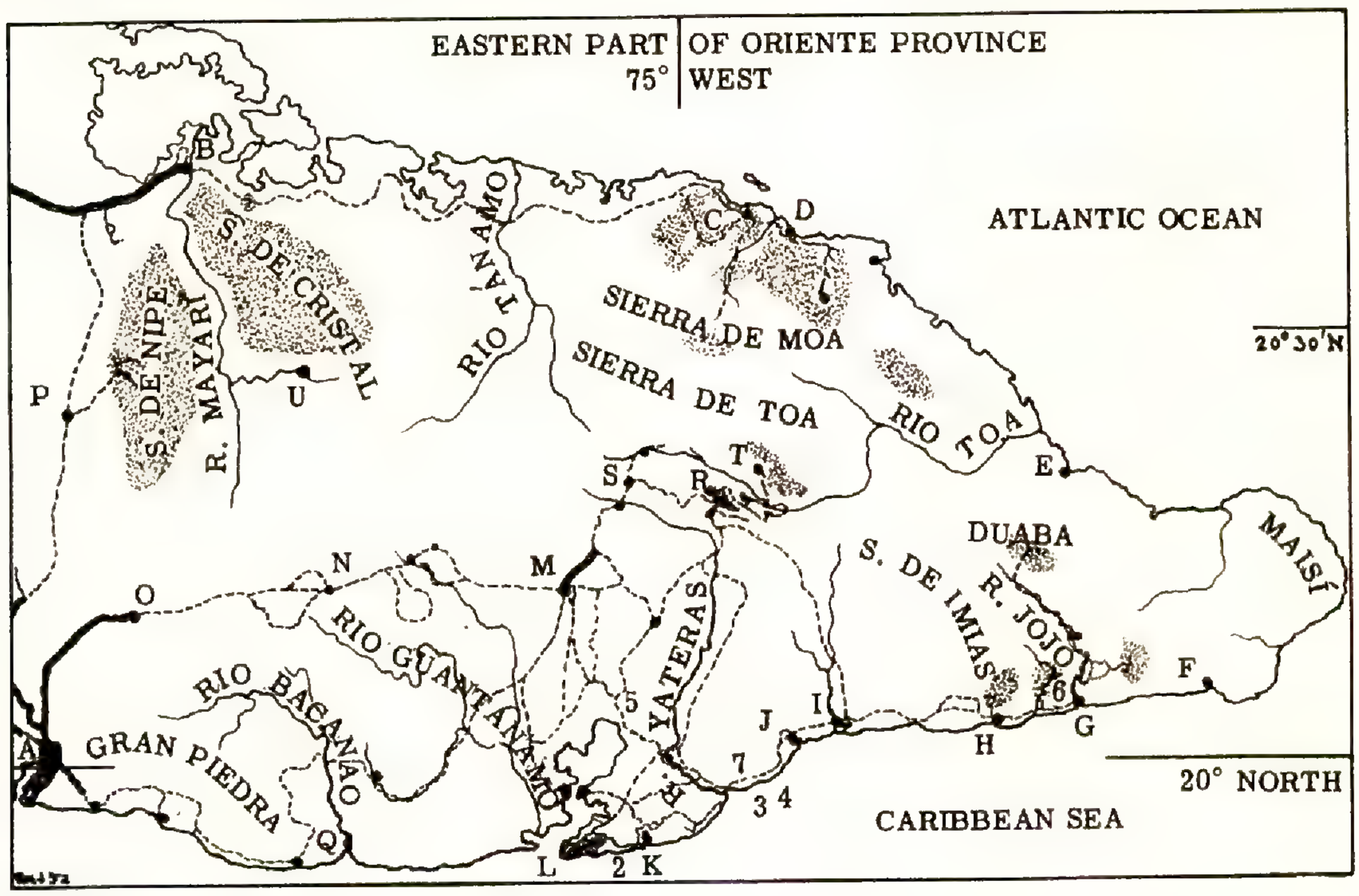



Fig. 1. Eastern part of Oriente Province, Cuba, indicating travel routes collecting localities, mountain areas, and the distribution of serpentine.

Double solid lines, all-weather roads; broken lines, jeep trails passable only in dry weather. Localities: A, Santiago de Cuba; B, Mayari; C, Moa; D, Punta Gorda; E, Baracoa; F, Jauco; G, Cajovavo; H, Imias; I, San Antonio del Sur; J, Baitiquiri; K, Escondido; L, U.S. Naval Base; M, Guantanamo; N, Sabonillo; O, La Maya; P, Central Miranda; Q, Sigua; R, Pinares de Ceiba; S, Monte Verde; T, Cafetal de Magdalena; U, Mayari Arriba. Stippled areas, serpentine formations with associated Pinus cubensis forests; cross-hatched areas, mountain regions; numerals indicate locations of correspondingly numbered illustrations in this article.

Fig. 2. Between the Guantanamo Naval Base and Escondido Bay, a palm-cactus association of Coccothrinax sp. and Lemaireocerus hystrix covers a large schist area of the low terrace. In the scrub thickets grow Randia, Capparis, Casearia, Catesbaea, Phyllostylon, Bourreria, Guaiacum, Hebestigma and numerous other xerophytic shrubs and small trees. From the palm in the right foreground the writer collected his no. 637, a Coccothrinax, not as yet determined to species.

east along the coast a short distance to Escondido Bay, but botanizing was restricted to the southeastern tip of Guantanamo Bay.

Before going to Cuba, I had read Marie-Victorin's description of Casearia guantanamensis, a new species which he had described from material collected by Britton in 1909. Systematically I searched for it and finally, only 200 yards from our apartment, I found a patch, but all sterile. Later I found it in profusion east of the Base along the shore toward Escondido Bay, but it wasn't until the following spring that it was collected in flower. Since then the first thicket that I found has been bull-dozed away, together with part of the hill where it grew.

The Bay area proved to be a rich collecting ground. Orchids such as Encyclia and Oncidium were common epiphytes on jatia

(Phyllostylon braziliensis); cacti — Harrisia, Dendrocereus, Cephalocereus, Melocactus and several opuntias were plentiful; Apocynaceae, both vine and small tree forms, abounded. Various species of Capparis, Lantana, Croton, Bourreria, Jacquinia, Solanum, Citharexylum, Erythroxylon, and other tropical genera soon filled my presses.

In November the rains diminished and roads became more passable. Accompanied by César Piña as interpreter and helper, I headed out along the coast toward the high mountains to the east. The roads defy description. One has to see Oriente roads to believe that such mud-holes exist. Coffee and banana trucks seemed hopelessly stuck in some. River after river was forded with the water swishing around our feet on the floor of the car. At the Rio Jojo, we stopped. A horseman had just crossed and the water came to the saddle. No jeep could have crossed without a completely waterproofed engine, so we reluctantly retraced our route.

A few miles to the west, we turned up the valley of the Rio Tacre, which empties into the sea after a short descent from the

Fig. 3. Near Tortuilla, a small beach resort, patronized by hardy jeep riders from Guantanamo City, the coastal terrace is low and wind swept. At this location a representative collection of marine algae was made (Jervis no. 1357), as well as an Agave (no. 788), an interesting Melocactus (no. 1358) and various other plants.

Fig. 4. Common in some areas near Tortuilla, a member of the composite genus Anastraphia, (close to Leon's A. elliptica var. inermis) forms low open stands on the loose weathered coral surface of the coastal terrace. (Jervis nos. 937 and 1359 were collected at this site.) A small somewhat woody Phyllanthus, first collected by Ekman along Santiago Bay, was also common here in niches of the bare rocks.

mountains. After fording the stream 38 times we reached the end of the road at Jagua. From this place, a small tienda high in the Sierra Imias, only a mule trail led onward. Rain threatened and we turned back, collecting along the way. Coccoloba trees, 40 feet high and two feet in diameter, lined portions of the stream bank. From the water's edge the cliffs rose to towering heights with here and there a spot less steep where a poor guajiro hacked out a space for his bohio and garden. Most of the original hardwood forest has been long since removed and Cecropia peltata has moved in, adding spots of white foliage to the new forest. On almost vertical serpentine cliffs perched Agaves, with creeping Selenicereus. Among the rich herbaceous vegetation, Aristolochia twined here and there. Succulent Pilea grew among the moist rocks, in some places forming pure stands fifty feet across. As we reached the lower valley, we found Melocacti very common and gathered plants to be sent back to the Michigan Botanical Gardens.

We camped on the dry coastal terrace under a spreading Guaiacum in an open spot among the cacti where a rock-free surface

allowed us to spread our blankets. There we killed the only scorpion that I was to see for several months. Cuba is unusually free of harmful animals. It has no poisonous snakes, no large wild animals, relatively few scorpions and centipedes, and few bothersome insects. Wasps abound in dry areas and in a few spots mosquitoes are common enough to be troublesome.

Actually vegetation proved to be less friendly. Various Cuban "guaos" such as Comocladia dentata and other species are more virulent than poison ivy. Many a time the stinging "euphorb", Platygyne hexandra, left my skin burning. Some kinds of Malpighia bear sharp glass-like double hairs on the leaves. Various Urticaceae make stinging welts. And in the xerophytic coastal area, those plants which do not have thorns, — long thorns, recurved thorns, double thorns, tiny thorns, and just plain thorns, have short brittle branches that act like thorns in tearing skin and ripping clothing.

All in all, the dense coastal thicket offered the botanist a decided challenge, but the results were worth the effort. Prominent

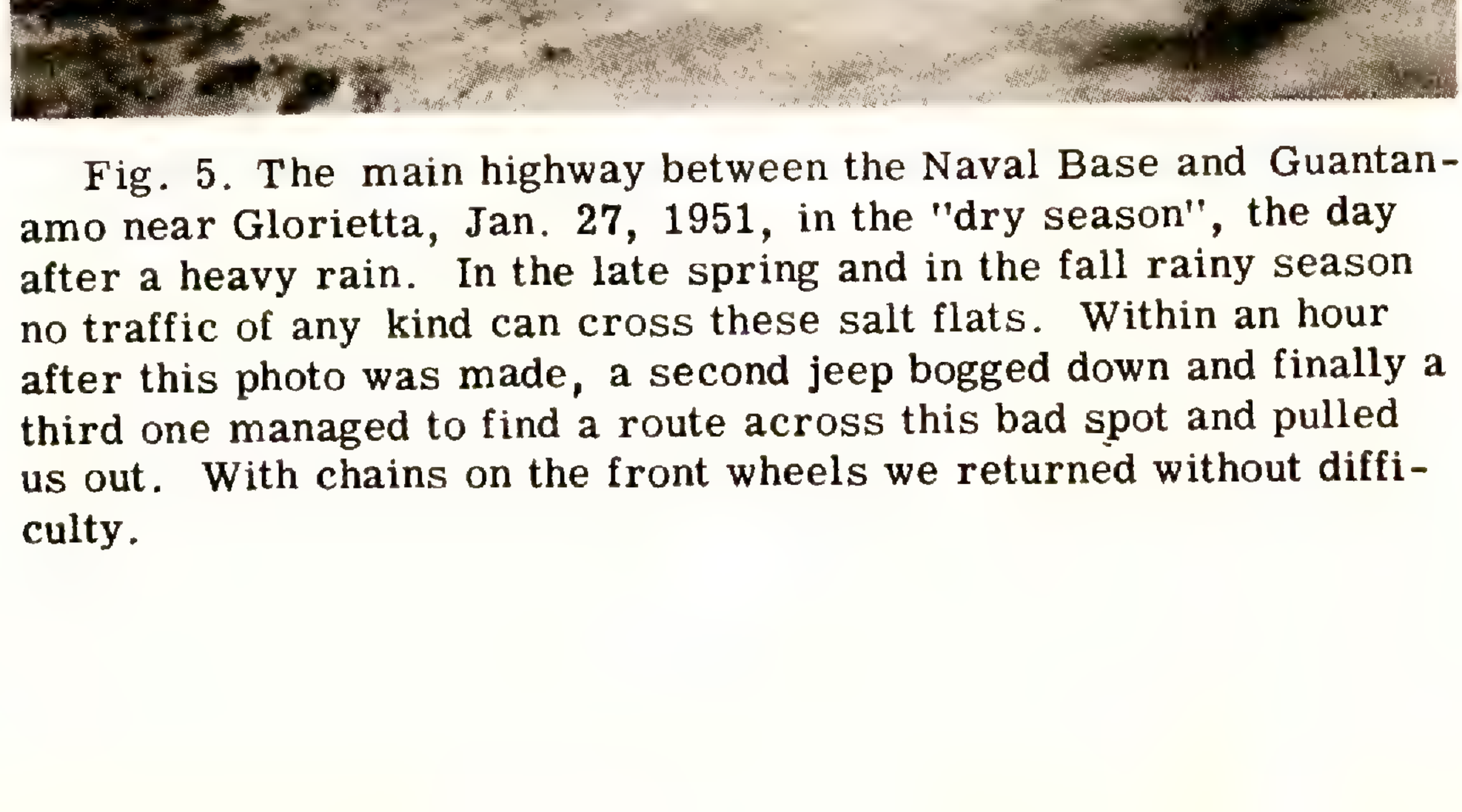


Fig. 5. The main highway between the Naval Base and Guantanamo near Glorietta, Jan. 27, 1951, in the "dry season", the day after a heavy rain. In the late spring and in the fall rainy season no traffic of any kind can cross these salt flats. Within an hour after this photo was made, a second jeep bogged down and finally a third one managed to find a route across this bad spot and pulled us out. With chains on the front wheels we returned without difficulty.

Fig. 6. César Piña, Cuban collecting assistant and interpreter, with a specimen of Clusia rosea Jacquin (Jervis no. 778) collected along the Rio Tacre near Jaguey, Oriente. Piña, very much interested in botany, is now a student at the University of Michigan.

among the dominant Guaiacum, Phyllostylon, and Lemaireocereus were tall slender Exostema, white-flowered Plumeria obtusa, Casearia comocladifolia, Hebestigma hexandra with long exserted gynophores supporting dry six-parted capsules, with various species of Erythroxylon, Croton, Capparis, Jacquinia, Bourreria, and thorny legumes filling in the thickets. Here and there were a few vines such as Aristolochia, Echites, Convolvulus and Cissus. The thin soil over limestone with included igneous gravel was almost bare, with some sedges such as a Scleria, with enameled achenes, and introduced grasses scattered in small clumps. In vain, I hunted for the shrubby and tree Compositae of the genus Anastraphia which are scattered along the coast. Nor did I find either of the woody tree-like cacti, Dendrocereus nudiflorus or Pereskia cubensis. However, Opuntia Dillenii in large clumps made progress difficult in more open areas of the coastal terrace.

Though we had brought three jugs of water along with our jeep-load of supplies, we faced a water shortage before we reached the Base. However, little tiendas along the way had kerosene-operated

refrigerators and sold all the soft drinks that one associates with American roadside stands, — and the price was just a nickel, even though the drinks had to be trucked in for miles along the difficult roads.

By the time we reached Baitiquiri Bay, not far east of the Yateras River, the presses were bulging and the jeep was almost covered by the camouflage of the entire top of a Coccothrinax which I took back to the Base to make up into specimens at my leisure. We camped the second night on the coastal terrace west of Baitiquiri among stunted vegetation dwarfed by the steady drying winds. Silvery blue agaves dotted the area and few other plants grew higher than our waists. Among species of especial interest were a soft velvety-leaved Anastraphia, pink-flowered Melocacti and more Casearia guantanamensis.

Back at the Yateras River, we forded safely although water poured in around our feet or rushed out the "port-holes" of the

Fig. 7. Between the Yateras River and Baitiquiri, the road follows through the xerophytic scrub of the low coastal terrace, in which scattered plants of Lemaireocereus hystrix are prominent. In the background is the rugged second terrace level of eroded limestone which is about 160 feet above sea level. The second terrace also has a xerophytic vegetation, with a species of Coccothrinax as the most striking plant.

jeep in a steady stream. I had become adept at disconnecting the fan and reassembling it after fording. This I had learned to do after spending an hour and a half stranded in the middle of the same Yateras River waiting for the ignition system to dry two weeks before. Five fords later we reached the road leading over the Guasima hills and drove back to the Base with the first of many collections made during the ensuing year from the coastal and mountain areas of eastern Oriente.

During thirteen months of collecting, I accumulated over 2,000 numbers, many of them from the serpentine-iron areas of south-eastern Oriente, whose existence and distinctive pine flora has not been previously noted by botanists. The more unusual species were sent alive to the Botanical Gardens at Ann Arbor if they were small enough to be suitable as additions to the greenhouse collections or if it was desirable to carry sterile material to flowering for determination. Other plants, of course, needed to be grown from more than one location under identical conditions to appraise the effects of different habitats on characteristics that might be of systematic significance. More than 75% of the Garden accessions sent from Oriente have been started successfully.

Fig. 8. Scrub vegetation east of Guantanamo Bay. The bluff is Eocene conglomerate. The sterile loose rock surface is a locality for Melocactus. The palm is Cocothrinax. Other character plants are the columnar cactus Lamaireocereus hystrix. An almost complete botanical collection was made at this locality.

# A FLYING VISIT TO NORTHERN ALASKA

F. G. Gustafson

MY TRIP to Point Barrow was short and late in the season (1951) and my impressions are therefore not likely to be typical, but they are such as an outsider gets of the country in late summer and early fall.

I left Willow Run Airport at 12:05 in the afternoon of one day and landed at Fairbanks, Alaska, the next morning at 6:30. My last sight of trees was that on the road to the airport and the next sight of trees was that at Fairbanks the next morning. There was quite a difference and only one who has experienced the contrast can visualize it. The only trees I observed in Fairbanks were Populus tremuloides, P. balsamifera, Betula alba var. Alaskana, and Picea glauca. The aspen and the birch were the most common trees, and they were small and spindling; not big and expansive like our maples and elms.

While in Fairbanks I visited the University of Alaska, five miles out of town on a hill overlooking the city. Its campus was mostly original woodland, and it was quite exciting for me to see Vaccinium Vitis-Idaea, which I had not seen since my boyhood days in Finland many years ago. The berries were disappointingly sour. I had a visit with Dr. John Buckley, recently of Syracuse University, who is in the Department of Wild Life Management. He told me he had a garden and I was much interested in seeing what vegetables he was growing and how well they were doing. The usual members of the cabbage family were doing very well; peas were excellent, and had been fruiting for a month and would no doubt continue till frost; potatoes were also doing well; beans were not going to fruit though they were planted as early as possible; tomatoes had green fruits, which would probably not ripen even though he had them backed with a reflecting surface of metal to enhance the heat of the sun. The permafrost is only a few feet below the surface even on the sunny side of a hill, as was this garden. In town I learned that tomatoes will not ripen outdoors so they are grown in greenhouses to protect them while young and to insure the ripening of the fruits in the fall. I was very much surprised by the brilliant colors of the cultivated flowers. The number of species used was not large, but those grew very well and blossomed freely. In front of one house at which I stopped to take some colored pictures they had Lobelia, Nemesia, sweet peas, Linaria, butterfly plant, Petunia, and geraniums. All were very striking. In many yards I observed unusually tall and colorful sweet peas, many of the plants six to seven feet tall.

The flight from Fairbanks to Point Barrow was disappointing because of the low clouds, but what I saw was low flat ground with innumerable lakes. At least north of the Brooks range, which I did not see at all, it seemed that water constituted at least fifty percent of the surface, and maps which I saw later bore this out.

During my two days at Fairbanks I had seen considerable of three oil men, two drillers and a petroleum engineer, who were also quartered at the Bachelor Officers' Quarters of the U. S. Petroleum Reserve No. 4 and who had just come from the north country. They told me very discouraging things of the country I was soon to see, but even with this advance information I was not prepared for the bleakness and lack of all vegetation taller than a foot. I don't think that anyone who himself has not seen a northern tundra can get an adequate picture of such a place even from the best of descriptions. The land is flat, terribly flat. The camp at Point Barrow is about nine feet above sea level and the ground there has been raised so that I should say the general level of the tundra is not more than five or six feet above the sea level and the permafrost in the middle of September was about twenty inches below the surface, so that there was no place for the water to go. It stayed where it fell. During the time I was at the camp I never sat down on the ground except once on the beach and even then I got wet, because the ground was too wet everywhere. The greatest elevation I saw above the general level was only a few feet high. Everything being muddy there were of course no roads, and travel was by "weasel". Many times I wondered what they did in that part of the world for a vehicle before the weasel was invented and manufactured for World War II transportation. These weasels are the most wonderful carriages I have ever seen, for they can go over and through anything, whether land, mud, or water, can cross any ditch, and swim in water. The speed is not great; once we travelled as fast as twenty-five miles in camp on quite a good road. On the tundra the speed was usually five to ten miles, but walking one did not make much over a mile an hour.

When I was at Camp Barrow the tundra was mostly brown or in spots reddish. The flowers were gone and most of the green was rapidly disappearing. Some of the grasses took on a reddish tinge but most of the plants turned brown. One of the most surprising things to even a theoretically informed new-comer, such as myself, is the complete lack of trees and shrubs as we use these words. I found four species of willow: Salix pulchra, S. reticulata, S. rotundifolia and S. phlebophylla. Of these four species only S. pulchra looked like a willow because it had slightly elongated leaves, and the stem was yellowish. The length of the stem was not

greater than fifteen inches and the plants resembled a procumbent juniper in that the tips of the branches did not actually touch the ground but nearly so. The other three species had rotund leaves about the size of partridge berries, and the stems were probably one to two inches long. It was quite striking to see these small procumbent plants attempting to produce pussy willows. Each catkin consisted of not more than one to four pistillate flowers. Willow was the only "tree" in this part of Alaska. Farther south there were birches and alders as well as other tree species. Saxifraga is one of the common genera in the region near Point Barrow and north of the Brooks Range. I collected Saxifraga hieracifolia, S. punctata var. Nelsoniana, S. cernua and S. foliolosa. These were all very common. The last two species were very interesting to a physiologist because in the axils of their leaves they produced a profusion of very small bulbils, which sprouted while still attached to the parent plant. Some of these I brought home and I am now trying to grow them. These two species seem to be losing the ability to produce seeds; only a very few fruits were seen and I was told that the S. cernua produces only one flower per plant. In some places the tundra was nearly white with the fruits of Eriophorum Scheuchzeri. This species of Eriophorum I was told is eaten voraceously by the lemming. These little arctic animals were not very common this summer. Another interesting plant which I found in considerable abundance in some places was Rumex arcticus or A-ku-lo-pak as the Eskimos call it. This plant was eaten by them before the advent of the white man and his canned spinach, which they now buy instead.

I visited Barrow Village and Browerville five miles from the camp several times. Both of these Eskimo places are now mudholes. The weasels have so badly chewed up the "streets" that they look like "hog-wallows." There are two churches and a school in Barrow village and the farthest-north post office in any part of United States or its possessions is at Browerville, which by the way is named after Charles Brower, who spent many years near Point Barrow. He married an Eskimo woman and one of his sons still lives there.

I notice I have said nothing about my reason for being in northern Alaska, seemingly a very peculiar place for a plant physiologist. I have a subcontract with the Arctic Institute of North America to study the vitamin content of some of the native plants from this region and I was collecting and lyophilizing plants for study at the University this winter. The trip was interesting and I may try to go there again.

## FORECAST FOR THE NEXT TWO ISSUES

SOME of the articles to be expected in the April issue have been indicated elsewhere in this number. Others which are in hand or being prepared for the next two issues are as follows:

A sketch of the career of Walter Tennyson Swingle, charter member of the Gray Memorial Botanical Association, news of whose death on January 19, 1952, at the age of 81, has been received;

The beginning of a series of letters on botanical and ornithological work in India, by Dr. Walter Koelz, whose most recent work has been in Nepal and Assam;

An article on a botanical mission to Okinawa, by Dr. Egbert H. Walker;

Observations on the bull thistle in Michigan, by Clarence R. Hanes;

Botanical news from the Philippines;

Glimpses of the natural history of Koror, Palau Islands, by Peter J. and Alma Hill;

Continuation of correspondence on oaks;

"The Wood Collectors' Society: its objectives and activities", by Jeannette M. Kryn;

Classified lists of members of the supporting associations, and other subscribers;

A communication from the Permanent Secretary regarding the election of officers and the proposed reorganization of the Gray Memorial Botanical Association.

Correspondence and an article on popcorn by Volney M. Jones and others.

Botanizing in the Tahquamenon area of Upper Michigan, by Alexander Smith.

Two more articles on the Oriente of Cuba, by Grady Webster and Roy N. Jervis.

Observations of a forest pathologist in Alaska, by Dow V. Baxter.

Botanical description of the Haven Hill Tract, Oakland County, Michigan: Part of a field reconnaisance report to the Michigan Natural Areas Council, by Paul W. Thompson.

The Convention of the Cactus and Succulent Society of America, at Denver, July 1951, by Sister Marie Fidelis Remski, I.H.M.

THE ASA GRAY BULLETIN, NEW SERIES. — An occasional publication devoted to more or less informal communication among the members of the Gray Memorial Botanical Association and the Michigan Botanical Gardens Association. Appropriate contributions from members of either group or from subscribers will be accepted. For the present, progress reports of current field, garden, and herbarium work, with readable and relatively non-technical articles in the fields related to systematics, botanical history, biography, and bibliography, will be preferred. There will be special emphasis upon preparatory work for a new "Flora of Michigan". Free use will be made of letters to the Editors (if released for publication by their writers) and of current news notes regarding botanists.

Items for publication should be addressed to either of the Editors at the Department of Botany, University of Michigan, Ann Arbor, Michigan. Contributors may secure reprints of their articles.

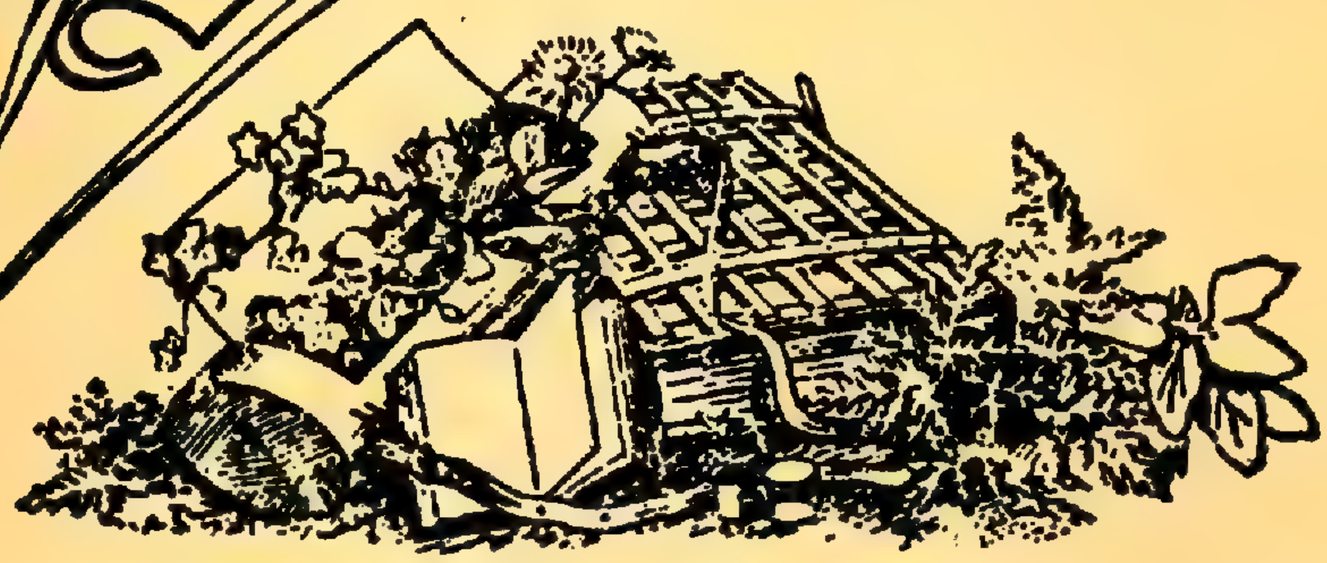
Address subscriptions ($1.00 for Vol. I, No. 1, but a regular subscription rate has not yet been set) to Dr. Ruth B. McVaugh, Business Manager, 403 Arbana Drive, Ann Arbor, Michigan.

THE GRAY MEMORIAL BOTANICAL ASSOCIATION, FOUNDED 1887. — This organization sponsored publication of early volumes of the Asa Gray Bulletin. Later it issued a mimeographed "Bulletin". Its object is to commemorate the life and botanical work of Asa Gray and to assist its members in botanical activity by furthering friendly correspondence and cooperation among them. Interested persons are invited to communicate with the Permanent Secretary, Professor R. Lee Walp, Building 305, Apt. 1, Stanford Village, California.

MICHIGAN BOTANICAL GARDENS ASSOCIATION. — Founded in 1925 to include persons interested in promoting the development and current activities of the Botanical Gardens of the University of Michigan. There are no dues, but subscription to the Asa Gray Bulletin is invited. For further information, communicate with Dr. Frieda Cobb Blanchard, Secretary, 2014 Geddes Avenue, Ann Arbor, Michigan.

N.S. Vol. I April, 1952 No. 2

# The Gray Herbarium Bulletin



*Edited and published for*

**THE GRAY MEMORIAL BOTANICAL ASSOCIATION**
**and the**
**BOTANICAL GARDENS ASSOCIATION**
**OF THE UNIVERSITY OF MICHIGAN**
**by**
***Harley H. Bartlett and Rogers McVaugh***

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**ANN ARBOR, MICHIGAN**

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# Asa Gray's Ascent of Grays Peak

ROBERT TAFT

*Reprinted from an editorial in*

TRANSACTIONS OF THE KANSAS ACADEMY OF SCIENCE

March 1951

Text books of science do not as a rule have remarkably long lives. The editor has made no intensive survey of the subject but would hazard the guess that twenty-five years would doubtless be a long life for a book of this class. The length of the professional life of an author, the rapid change of scientific thought and changing methods of presentation are of course the obvious causes for the relatively brief existence of many texts, even many that were popular and well-known in their day.

There are at least two exceptions to such a general rule among American texts: *Dana's Manual of Mineralogy* and *Gray's Manual of Botany*. The first of these texts, now in its fifteenth edition, had its initial appearance in 1848. Little remains of the original text book, one of my colleagues tells me, save the name. In the same year that Dana first published his book, however, the first edition of Asa Gray's manual appeared. One hundred and two years later there was published the eighth edition of *Gray's Manual*. Greatly changed over the initial venture, the *Manual* still retains some features of the original text, according to Dr. H. H. Bartlett, who recently reviewed the book in *Science*.

Although the *Manual* considers the flora of eastern Kansas and Nebraska, as part of northeastern and central United States, we might point out that Gray, for 45 years a member of the Harvard University staff, was interested nearly a century ago in the flora of Kansas and was jointly responsible for one of the early lists of plants in the Kansas region. The collection of

Asa Gray, probably the best known of all American botanists. A note on the back of this photograph states "Taken in 1866 or 1867, probably the former." The photograph was given the editor by Francis P. Farquhar, president of our sister institution, The California Academy of Sciences.

flora upon which Gray's list is based was made in 1853 by the German botanist Creutzfeldt who accompanied Capt. J. W. Gunnison's survey for a proposed railroad to the Pacific, one of a number of such surveys carried out in the mid fifties. Gunnison and his party left Westport (now part of modern Kansas City) on June 23, 1853, and during the summer months of that year followed a route south and west over the Santa Fe Trail, much of the time being spent within the boundaries of modern Kansas.

The plants collected by Creutzfeldt during the summer of 1853,

were later identified and catalogued by Gray and by his teacher and collaborator, John Torrey; the list appears in the Gunnison-Beckwith report published in 1855.

It was not until many years after the publication of this report that Gray actually saw the plains and prairies of Kansas. As a matter of fact, as Gray himself wrote, he had "never seen even the Mississippi" before 1872. In the summer of that year, he and Mrs. Gray visited California, and on the return trip stopped in Colorado and then crossed Kansas on the railroad journey from Denver to Kansas City. As far as the editor knows, Gray was moved to no illuminating comment when Kansas came before his eyes. Both he and Mrs. Gray, however, were greatly pleased with their entire western journey for we find him writing to a friend on his return that it was "a journey full of interest, not a bit monotonous or dull, from first to last."

The high point of the trip—both literally and figuratively — was Gray's ascent of Grays Peak in Colorado. The peak had been named for Gray in 1862 by Dr. C. C. Parry, a student of Gray's and himself a botanist of note.

Since the story of the ascent has been buried these many years in a contemporary newspaper account and since we can make—as the editor is always willing to do—some Kansas connection out of it, the story will here be told.

Grays Peak, one of the highest in Colorado and the continental United States (elevation 14,341 feet) is some 17 miles from Georgetown, in central Colorado, and it was here that Professor and Mrs. Gray and nineteen other interested participants assembled on August 13, 1872, for the ascent which was begun that afternoon. Most of the party went as far as Bakersville, a collection of a few rough cabins some eight miles distant from Georgetown, and there spent the night. The real work of the ascent was begun the next morning. The ascent, it should be said, was and is not difficult as far as mountain climbing goes, and as can be seen from the fact that six women, including Mrs. Gray, were members of the party. Gray, too, was no longer a young man for he was 65 when the climb to the top of the peak was made.

The ascent was, of course, hard work as there was almost no trail, and what trail existed was exceedingly rough. Although a number walked, the ladies at least, made the trip on horseback.

The summit, a flat area some 300 feet long and 25 or 30 feet wide, was reached by ten in the morning. Included in the group who met on that lofty ridge were several ministers, a judge, a newspaper editor, two other botanists of national repute in addition to Gray (C. C. Parry already mentioned who planned the trip and E. L. Greene), and the principal of the Georgetown school, "Rev. Prof. R. Weiser." Unknown to Gray, a formal meeting on the summit had been

planned and was called to order by Judge McMurdy who pointed out that the party was standing on the divide that separated the waters of the Pacific from those of the Atlantic.* He also called the attention of the group to the fact that a neighboring elevation, looming up only a mile away was Torrey Peak (only five feet difference in elevation exists between Grays and Torrey Peaks), named for Gray's colleague.

McMurdy then introduced Professor Weiser who made a formal address and speech of welcome to Gray. The speech, replete with ornamental rhetoric, with the inclusion of poetry and Latin quotation, was listened to with "most profound attention" by most of the group but doubtless with growing uneasiness by Gray himself who was was not a public speaker and who knew he would undoubtedly be called upon for a reply.

Gray acquitted himself acceptably to the group, however, for the *Colorado Miner* (Georgetown) of Aug. 22, 1872, which devoted four colums to the notable event, was able to report concerning Gray's remarks: "Among other things he said that he was not accustomed to public speaking, and that he could not express what he felt in his heart, but thanked the company for the honor they had shown him—The Prof. further said he was on his way home from a long journey to California and Oregon, that he had visited all the most famous localities on the Pacific slope, among which he mentioned the far-famed Yo Semite valley, but no where had he seen any scenery equal in grandeur and sublimity to the view from this peak. He had also traveled in Europe, but saw nothing there that surpassed this view."

The formal occasion was concluded by singing "the National Air 'My Country 'tis of Thee'—and what was interesting a son of the author of that patriotic song was present and helped to sing it."

"The party then enjoyed the grand scenery for an hour," the *Miner* concluded," and then left for Georgetown, where they all arrived safe and sound at 8 o'clock, "well pleased with their visit to the peak, from whose summit is had perhaps the most extensive and magnificent view in the world."

Gray himself later wrote his friend Charles Darwin in England concerning the ascent: "The day was perfect, the success complete, and the memory of it one of the most delightful of the many pleasant memories of the whole journey."

Indeed the memory ot the first ascent was so vivid that it brought Gray back five years later, when in the summer of 1877, he not only climbed Grays Peak again but he crossed over to Torrey Peak and stood upon its summit.

*For those of the editor's readers who are looking for the Kansas connection previously promised in the discussion above, the mention of the divide is "it." Since Grays Peak is part of the continental divide it formed part of the western boundary of Kansas Territory when it was organized in 1854 but it was lost to Kansas when the state was organized in 1861.

# WALTER TENNYSON SWINGLE: BOTANIST AND EXPONENT OF CHINESE CIVILIZATION

Harley Harris Bartlett

WALTER TENNYSON SWINGLE, who died at Washington on January 19, 1952, was one of the last survivors of the group of young botanists who founded our Gray Memorial Botanical Association in 1887 and initiated its activities in 1888. Dr. Cornelius L. Shear may now be the last of the founding members, but there has not yet been time since the re-organization of the Association to trace to their conclusion the careers of several whose names appear on the early roll.

In the historical sketch which appeared in our first number it was stated that "an adequate history of such an organization as the Gray Botanical Memorial Association would have to be largely biographical, dealing with the botanists who belonged to it, and were helped by it to become effective amateurs or professional botanists." Brief biographies of early members were promised, as supplements to the brief historical sketch, and, even before the promise was published, news of Swingle's death was received. He was one of the most distinguished of the founding members, and, indeed, one of the outstanding American botanists of his time, notable not only for his many accomplishments in botany, but likewise as a student of Chinese contributions to science, technology, and civilization.

## Childhood and Early Youth at Manhattan

Walter Tennyson Swingle was born January 8, 1871, on a farm in Canaan Township, Wayne County, Pennsylvania, the son of John Fletcher Swingle and Mary Astley Swingle. His mother was born in England. When Walter was two years old the family moved to Manhattan, Kansas, where they bought a hill farm. This proved to have very poor soil, so it was eventually sold and another one, on good prairie land, was purchased. As the boy grew up he helped his father cut wood and attended to other farm chores such as driving the cows home from pasture. He loved the plants he saw, and, if no one could tell him what they were, he made up names of his own for them. He stuttered badly as a boy, and had a hard struggle to overcome this difficulty of speech. Obviously, however, it did not handicap him too greatly, for his extraordinary proficiency in systematic botany, before he had had much, if any, formal education, set him apart as somewhat of an intellectual prodigy.

It is always interesting to know what early influences incline a

Fig. 1. Walter Tennyson Swingle, 1941. Photograph by Robert Taylor. (This is one of the two pictures of Dr. Swingle which his family considered the best.)

child toward the subject that eventually becomes a life work. Not too much is available at the moment about Swingle's boyhood, although there may be sources that will eventually become available. We have his own word for it that his early schooling was irregular, and that for the most part he was taught at home. That, however, he looked upon as an advantage, for in later years he held, with his friend O. F. Cook, that regular schooling might result in too much regimentation and standardization, and that children would develop faster and with greater individuality if allowed to follow their natural bents.

It was fortunate indeed that Manhattan was the seat of the Kansas Agricultural College and Experiment Station, for in the person of Professor William Ashbrook Kellerman young Swingle at the age of seventeen found someone who could broaden his natural interests in systematic botany. How he had developed scientific competence so early may not be a matter of record, but it is a fact that it was also when he was 17, and two years before he graduated from college, that he was given the title of Assistant Botanist in the Experiment Station.

It was only natural that Swingle, after falling under Kellerman's influence, should have turned to mycology and plant pathology, the subjects which then chiefly interested Kellerman. Of this Fairchild writes: "I first met Walter T. Swingle in the laboratory of Dr. W. A. Kellerman . . . Dr. Kellerman was a pioneer in the study of plant diseases, and Swingle entered that new field with the enthusiasm that was to characterize him through his 81 years of life. He showed me some black powder, the spores of a fungus that sometimes transformed the heads of wheat and ruined the crop -- the so-called 'bunt' of wheat. Swingle's discovery that this could be stopped by plunging the grain used for seed into hot water before planting became one of the standard farm practices. He was only 16 when he read a paper on the rust of cereals before the College Scientific Society."

Swingle received the degree of B. S. at Manhattan in 1890, and left for his life-long career in the U. S. Department of Agriculture in 1891. The bibliographic record of this youth's accomplishment from 1888 to 1891 is remarkable, for although most of the articles that appeared during this period were in joint authorship with Kellerman, there were at least twenty-seven of them, varying from brief notes to papers of considerable length, and he was sole author of six. He must have been one of those charter members of the Gray Memorial Botanical Chapter who had no trouble about turning in reports of botanical activity quarterly or whenever they were due! Members of the Gray Memorial Association are likely to see significance in the fact that Swingle was one of its charter members in 1888, the year of his first publication, and that this organization (it was founded as the Gray Memorial Chapter of the Agassiz Association, in December, 1887) had just commenced its activities with the requirement of a quarterly report of botanical activity from each member.

These early publications fall into two groups, and each group initiated a phase of Swingle's career which was of long duration or continuous throughout his life.

It would now be interesting to know what he wrote about in his early unpublished reports to the Gray Memorial Botanical Chapter, apparently no longer in existence, but that there were any that could be classified as juvenilia is to be doubted, since he was writing for publication at the same time, and was already under Kellerman's guidance. Swingle's publications, of sole or joint authorship, appeared in the "Journal of Mycology", the "Reports of the Kansas Agricultural Experiment Station", and "The Industrialist", a serial publication of the Kansas State Agricultural College.

Most of the early papers were on mycology and plant pathology. His interest in this general field continued, as was shown by the vigorous measures which he advocated during his later life for eradication or control of citrus canker and the dreaded South American

"tristeza" disease. He favored the most drastic quarantine restrictions on international citrus introductions. Swingle's last paper on pathology that had a background of his early observations and research in Kansas seems to have been a Farmers' Bulletin of the U. S. Department of Agriculture on the prevention of smut in wheat and oats, issued in 1906. Some years later, however, he undertook the writing of definitions of mycological and plant physiological terms for Funk and Wagnall's "Standard Dictionary of the English Language" (Editions of 1913 to 1931), in which task he was aided by his eminent colleague in the Bureau of Plant Industry, Erwin F. Smith.

A second group of his early contributions record the beginning of his life-long activity as a plant breeder and student of genetical phenomena, for there are six contributions on maize hybridization and the characteristics of the hybrids through the third hybrid generation. After he went to Washington his work on corn was discontinued, for the project remained at Manhattan as part of the continuing program of the Kansas Agricultural Experiment Station. Swingle's subsequent work on plant hybrids was to be mostly with Citrus and allied genera.

It was during the Manhattan period that Swingle determined to learn to read technical German with facility. This had not come about through the taking of formal courses, so he turned for help to a German immigrant laborer whose job was to feed the pigs! This man's aid and his own diligent study enabled him to read German easily and prepared him for later study at the German universities of Bonn and Leipzig.

He formed student friendships at Manhattan that lasted throughout life. It was there that he first knew David Fairchild and Frank Thackery. He remained an associate of Fairchild's in the Department of Agriculture, and when he was abroad on numerous missions of plant introduction and exploration, his most indefatigable and voluminous correspondent was always Fairchild. Mrs. Swingle writes that "Frank Thackery was in a later class and went into the Indian Service. Their paths converged when Mr. Swingle had cooperative work with the Indian Service, and later Thackery became his assistant in the date work. Their personal friendship also led to prospecting for copper mines, though without financial results."

Swingle's connection with the U. S. Department of Agriculture began in 1891, before he was of age, and he was unable to accept appointment without parental permission. He was only twenty. Fairchild writes: "In 1889 I joined the little section of Vegetable Pathology of the just recently established Department of Agriculture, and in 1891 Swingle became the seventh of that tiny group of research men — all of us scarcely more than boys. Intense interest was developing in Bordeaux mixture, which had rather recently been discovered in France, and American orchardists were clamoring for plant pathologists to help them fight their tree diseases. While I went to western New York to spray apples for scab, Swingle went to Eustis, Florida, to see what

ailed Mrs. Tom Platt's orange trees. I still have a postal card from him saying that orange trees looked something like oaks, but had orange-colored fruits hanging from their branches. And so began Swingle's life-long, deep interest in citrus. New interests were taken on with such avidity that his bibliography became increasingly varied. With Dr. H. J. Webber, his early collaborator in the production of citrus hybrids, he was greatly interested in establishing a Subtropical Laboratory. Jointly and individually they wrote about its objectives in 1892 and 1893. Experience in Florida led to publication of observations on Florida Fungi, of a new Florida palm, of experiments on control of White Fly and Red Scale, of the diseases of citrus fruits, of improved methods of making Bordeaux mixture. As to Swingle's dominating absorption with the botany of Citrus, I must again quote Fairchild, who says: "He undertook almost at once the breeding in north Florida of all the kinds of citrus then known there; a work with which the names of Ralph Robinson and Frank Savage and his son Maurice will always be associated. I have on my desk before me here the Minneola tangelo -- grown extensively now -- evidence of his first entry into a Florida citrus grove."

### Study in Germany: Travel Abroad

The first four busy years in the Department of Agriculture were largely taken up with joint work in Florida with H. J. Webber. Then in 1895 Swingle went to Germany, to study at Bonn. The outcome was a contribution in German on the cytology of the Sphacelariaceae, published in 1897. Again, in 1898, he studied at Leipzig.

At home and abroad, the publications from 1896 to 1916 give evidence of work on the diseases, life history, agronomy, introduction, or improvement by breeding of pineapples, guava, coffee, burr artichoke. fig, date. pistachio, and cotton, but also show a growing intensification of interest in Citrus and allies. After 1916 the initiation of new work with plants generally had some connection with citrus, but his historical delving in Chinese literature was well under way.

Work on the "caprification" of the fig began to be published in 1899 and extended at least down to 1910. It was Swingle who introduced the insect which pollinates the fig and thereby insured the success of fig culture in the United States. He never lost an opportunity to add some bit to his knowledge of "fruit" production in the fig.

### Introduction of Date Palms

Swingle's name, in the minds of many, stands chiefly for the memorable achievement of introducing date culture into the Southwest. It has eventually placed him, with Fairchild, at the top of the little group of eminent plant introducers who began their work when the Department

of Agriculture was young, but the prestige that came to him for success was of necessity somewhat deferred, for date palms do not quickly come to maturity. By the time his palms were in bearing, and a new industry had been established with which his name will always be associated, Swingle had shifted his main botanical interest to Citrus and its allies, and his chief geographical field from the Mediterranean region to the Far East. Nevertheless his many publications on date culture ran clear through from 1901 to 1947, and his most elaborate publication, aside from his treatise on the Citrus allies, is his famous Bureau of Plant Industry Bulletin No. 53, of 1904, on "The Date Palm and its Utilization in the Southwestern States."

He well realized when he plunged into the job of introducing date cultivation into America that there would not be any quick or certain results. Fairchild sent him on his quest to North Africa, and recollected the circumstances years later. "I remember as well as if it were yesterday what Swingle said when he heard that he had been chosen to bring in the date", Dr. Fairchild said: '"My land!', he exclaimed, 'we'll be old men before we can get a date industry established.'" But Swingle lived to see the industry a successful one, and even to own and operate his own experimental date garden at Indio, California. So long as Swingle was in Washington nobody could ever rightly accuse the Bureau of Plant Industry of having a dearth of ideas! The man effervesced with them.

Sometimes they stirred up rather violent controversies. The greatest excitement was about his theory of metaxenia, the term which he devised for the modification of parental tissue of date fruits by the development of a hybrid seed within the fruit. His opponents held that his observations had been wrong; that any supposed effect on the tissues of a pistillate parent, because of having been pollinated by another species, and bearing hybrid embryo and endosperm, was all imaginary bosh and nonsense. Swingle was confident of the accuracy of his observations. What irritated him especially was the apparent assumption by some of his critics that he was scientifically a moss-back, who might possibly not understand elementary genetics, and whose conclusions need not be seriously received. Hormone effect was eventually proposed by Swingle as the explanation of his observations, but plant hormones were not yet being talked about and the old ideas of "formative staffs" were seldom mentioned. Swingle stuck to his view that tissues outside a developing hybrid date seed might be morphologically modified as a result of the hybridity of the developing embryo and endosperm, and published several times on the subject.

## Years Devoted to Citrus and the History of Chinese Botany

Swingle's chief activities and interests are rather easily classified by the time at which they began, but it was characteristic of him that

Fig. 2. Walter Tennyson Swingle at Fresnal, Arizona, January, 1942. Photograph by R. H. Peebles, co-author with T. H. Kearney of the "Arizona Flora" (1951).

he seemed never to lose interest in anything which had once engaged his attention. This characteristic is indicated by the recurrence of similar topics in his bibliography. Indicating that the list is probably incomplete, because Swingle contributed to widely scattered periodicals, his colleague of later years, Frank D. Venning, has sent a bibliography of the 251 titles that have so far come to light in the indexing of his library and files, which were presented to the University of Miami.

In the remainder of this brief biographical article I shall emphasize Swingle's chief later activities, namely, his work on Citrus and on the building of the Oriental collections in the Library of Congress, which were the things that mainly occupied his thoughts in the years after 1915.

These two activities were closely and logically connected, as will be seen, for as early as 1893 he had published on the desirability of introducing certain types of Oriental citrus fruits into American horticulture, and had begun to look into Chinese literature. His initial concern with one phase of Chinese culture broadened as the years passed.

His interest in Citrus therefore began before his great work of establishing date culture in the Southwest.

## Swingle's Family and Friends

I knew Swingle fairly well from 1909 to 1915, but saw him after that only on frequent visits to Washington and at scientific meetings, the chief one being the Pacific Science Congress of 1926, at Tokyo, to which he was a member of the official American delegation. Whenever I visited Washington I was likely to be invited to lunch by one or another member of an informal "lunch mess" to which he belonged. The mess rented the dining room and kitchen (for noons only) in one of the old houses near the Department of Agriculture, where it had a minimum of cooking utensils, table ware, various supplies in common, such as rye bread, cheese, coffee, milk, etc., and where individual members could add to the menu whatever they wanted to bring with them. Maybe it was all arranged on a rotation basis, but to an uninformed visitor the arrangements seemed delightfully informal and hit-or-miss. Those who were there frequently (whether all belonged regularly to the mess I do not know) were Swingle, Wm. R. Maxon, T. H. Kearney, F. V. Coville, Carl Schofield, O. F. Cook, G. N. Collins and Lyster H. Dewey. Of this group, I am informed by Mrs. Swingle that Swingle, Cook, Schofield and Collins all lived in one of the Maryland suburbs of Washington and were especially close associates. In fact, after the death of his first wife, in 1910, Swingle lived with his intimate friends, the Cook family. In 1915 he was married a second time, to Maude Kellerman, the daughter of his Manhattan professor, W. A. Kellerman. She, with four sons and daughters, survives him. She was also his associate at the Department of Agriculture in some of his most interesting scientific work.

Regarding the children, I shall quote Mrs. Swingle, who writes: "Mr. Swingle was exceedingly proud of and devoted to his four children, the first, boy and girl twins, John and Stella (named for his Father and my Mother) born in 1920 after we had been married five years; the other two, Frank and Mary, born in San Diego, in 1923 and 1928. Frank was named after Frank Thackery, with his middle name from his maternal greatgrandfather, Anthony Dennis who was a physician of Amanda, Ohio. Mary was named for Mr. Swingle's mother. John was named John William, the William being for my father. John and his father used to have long arguments about every subject under the sun. When Stella was in High School she and her father used to take long walks while they conversed in French. Frank was becoming the engineer while still young and he and his father had long talks about the "dozenal" system of counting -- Frank even made a slide rule for this system. With Mary there were long chess games.

"Mr. Swingle was never fond of being photographed, except for

numerous passport photos. I enclose one in the field and two that are the family favorites. There is an early one in Andrew Denny Rodgers' excellent book, "Liberty Hyde Bailey," with which you are no doubt familiar. There is one in the "Citrus Industry" published by the U. of California Press, and one in the National Geographic in an article on the Library of Congress (I think this was Feb. 1951).

## The Botany of Citrus

As he became older Swingle's work on Citrus came to have more and more of a systematic turn, until it culminated in 1943 in a substantial and comprehensive monograph entitled "The Botany of Citrus and its Wild Relatives of the Orange Subfamily." This, although included as Chapter IV in Webber and Batchelor's "The Citrus Industry" is a substantial volume of over 400 pages as issued in the separate author's edition. It is almost unique in presenting the coordinated taxonomy of a whole group of cultivated and wild plants in which the descriptions of critical structures are drawn up from type or authentic specimens restored according to the method of Juel and sectioned. The whole research was done with painstaking care, and no effort was spared to secure adequate new material from distant and difficultly accessible places. Such work can hardly be too highly commended.

It is interesting to note in passing that two of the genera of the citrus allies are Merrillia, named for E. D. Merrill by Swingle, and Swinglea, named for W. T. Swingle by Merrill. By kind permission of Dr. Fairchild we expect in our next number to reproduce a photograph showing both of these botanists with their colleagues Fairchild and L. H. Bailey, taken in 1938 on the occasion of the dedication of the Fairchild and L. H. Bailey, taken in 1938 on the occasion of the dedication of the Fairchild Tropical Garden in Coral Gables, Florida. Seldom is a picture taken of so distinguished a group!

## The Pathology of Citrus

It has already been noted that Swingle never relinquished interest in a subject to which he had ever given deep attention. Since his early experience had been in plant pathology, seen through spectacles well splashed with Bordeaux mixture, one readily understands why his citrus work was deeply influenced and its direction largely determined by considerations of plant pathology. He was constantly concerned about breeding disease-resistant stocks and scions. He was always concerned with the problems of propagating disease-free plants from infected ones. This led him to experimenting with the seeds containing false "embryos," which are well known in Citrus. He found that these actually provided a means of side-tracking the accumulated infections that were carried on by grafting. "Neophyosis" was Swingle's

newly coined term for the rejuvenescence of Citrus varieties which had become run-down or senescent by virus or other infections which were transmitted by ordinary methods of vegetative reproduction, by grafting or growing from cuttings. He found that propagators could take advantage of the curious fact that the seedlings of Citrus are often of two kinds, namely, those derived in the ordinary way through fertilization and those derived vegetatively from nucellar buds growing out into the embryo sac. The latter, of course, reproduce the seed-parent type with the same fidelity as any other vegetative bud, but, Swingle found, were more likely to escape infection and could therefore be used for starting renewed, disease-free subclones of old horticultural varieties which had deteriorated because other methods of vegetative propagation had resulted in carrying on accumulated infections.

He devised elaborate measures for the control of citrus canker, and, later, for insuring by rigorous application of quarantine controls that the dreaded "tristeza" disease of South America should not reach the United States. Fairchild writes: "it was Swingle who first called attention, in this country, to the terrible citrus disease 'tristeza' which was wiping out millions of trees in Brazil and Argentina and has since reached California."

When Swingle's mind was occupied by the threat of epidemic citrus disease he was oblivious to most other matters and reiterated his warnings and proposed precautions literally to all who would listen, whenever they would listen. Reading the following in a Miami Herald's excellent obituary must have made many of Swingle's friends fondly recall very similar incidents, for the reporter pictured perfectly one aspect of Swingle's strong individuality. He said: "Swingle had a mind like a bulldog. It never let go. In an interview in 1947 at the University of Miami, he would talk of nothing but "tristeza" disease of citrus. He wanted to collect all kinds of citrus species and to test them to see which ones were resistant to the disease, and to try them out as rootstocks for commercial citrus.

"Two years later the tall, white-haired Swingle was attending the Florida State Horticultural Society meeting at Tampa. When he spied the same reporter in the hotel lobby his face lit up with enthusiasm, and he rushed over. 'I'm making considerable headway toward getting that collection of citrus relatives together', he said, picking up where he left off at the University of Miami two years before."

## Permanent Collections of Breeding Materials

I am not sure whether it was Swingle or that other grand old man of botany, Liberty Hyde Bailey, who first talked long and earnestly about the desirability of assembling permanent collections in experiment stations and botanical gardens of all the wild allies of cultivated plants,

as well as old and discontinued horticultural varieties, as a precaution against extinction of evolutionary starting points and in the expectation that epidemic disease or other adversities might at any time make it necessary to give up the cultivation of the most popular horticultural varieties and to go back to original or old sources for the synthesis of new ones. Certainly while Bailey was talking about it with special reference to apples, pears, grapes, and other northern economic plants Swingle was advocating the desirability of maintaining permanent living collections of wild and cultivated species and varieties of Citrus and allied genera, as well as other subtropical and tropical groups. As a matter of fact, the idea had been more or less clearly formulated in the minds of many. If Swingle and Bailey may have been only two among many, they were certainly among the most vigorous and outspoken advocates.

Swingle in the earlier years of his preoccupation with Citrus lost no opportunity to state that a great horticultural industry based upon two or three disease-susceptible varieties might be totally wiped out by the introduction and running wild of a single disease. He said that citrus canker, out of control, would wipe out the citrus industry in Florida, that new disease-resistant hybrids could probably be produced to guard against such a calamity, and that nobody could predict what wild ally or old discontinued horticultural type might provide the necessary genetic factor for meeting a particular emergency. So all types of the Citrus group should be carried on, even those apparently most worthless. To Swingle their purely botanical interest would justify it, but since he knew that a hard-headed and unsentimental business world would be unimpressed by such considerations, he emphasized the fact that points of departure for breeding improved fruits might be no more necessary than breeding new types of stocks upon which to graft them. He said that immunity to all diseases of the root might not necessarily be easily bred into existing types of stocks upon which a current industry depended, and that breeding of new stocks from original or old points of departure might be equally as important as producing scions with new genetic compositions.

He advocated the testing for resistance or immunity of all known citrus allies against the prevailing diseases of all citrus-growing areas. This was to be followed by production in each country of new disease-resistant varieties which were to be commercially introduced if possible but certainly to be held in reserve for emergencies. No one knew better than Swingle the deep aversion of commercial growers for bothering with any but two or three standard varieties. He maintained, however, that they should be educated up to the point of insuring their own interests no matter how resistant to ideas they might be.

Swingle was essentially a man of ideas. They overflowed his mind, and he wanted to put them all into execution. In the period following 1915 he was determined to have a disease-free citrus experiment

station on an island of the Inland Sea of Japan, and others elsewhere. Deeply imbued with caution against the danger of disease introduction with plant introduction, he advocated the making of hybrids by the long-distance shipment of pollen. Maude Kellerman, who became Mrs. Swingle in October 1915, had demonstrated the practicability of keeping pollen viable for long enough periods so that it could be shipped half-way around the world, or bridge the time gaps between the flowering times of different species. He wanted to make cold-resistant hybrids in order to extend citrus culture at least up to Virginia, and argued that it could be accomplished because the trifoliate orange, which he set apart from Citrus as Poncirus, was hardy at Washington. The original shrub which provided pollen for some of his first intergeneric or at least inter-sectional pollinations stood directly in front of the old red building of the Department of Agriculture, and a planting of its descendants should be made there as a living memorial to him.

## Citrus Hybrids

Swingle and his coworkers produced a great variety of botanically interesting Citrus hybrids between widely different species or even between distinct genera, to which he gave hybrid names, such as "citrange", and the citranges themselves included various subsidiary horticultural varieties which are named in the conventional way. His enthusiasm for the manifold scientific values and practical virtues of these hybrids was boundless. I remember well his pleasure in getting his friends in the Department to try "citrangeade". I think it was in 1910, in Swingle's office, that I became acquainted with it, after he demonstrated the proper way to make it. He admitted that the flavor of the essential oil from the peel was too powerful for most tastes, so he showed how the skin should always be peeled half way through its thickness in a zone all the way around the fruit "at the equator." Then the fruit should be sliced into halves through the peeled zone, when the juice could be squeezed out without acquiring too distinctive a flavor. I liked it even if no precautions were taken. (I'm one of those who prefer a good tangy turpentiny sour mango to a really "good" one.) Swingle used one of his first sizable "crops" of these strange hybrid citrange fruits for a test at a meeting in Washington and caused no little amusement by his argument that all should try to learn to like them whether they did at once or not, because taste was something that could be cultivated. The citranges and some of the other hybrids have met with some acceptance for non-commercial plantings and their spontaneous segregates and secondary hybrids may be expected ultimately to enrich horticulture, even if it should come about by the said process of destruction of present standard fruit varieties by disease. It appears that since Swingle's retirement some of his introductions and productions have not been officially kept in recorded and controlled cultivation, and it is of course inevitable that some would have been lost under any

conditions. It is to be hoped that the University of Miami will reassemble and maintain as many as possible.* It used to be said in Washington that unless restrained by budgetary limitations Swingle would breed more projects and jobs than a hundred others could keep going. Some thought that he was too prolific of ideas, of which there was a plethora, but others took his ideas pretty much at face value and wished to test them. The latter in the long run will prove to have been the wise ones.

## Swingle's First Delving into the History of Botany and Agriculture in China

Swingle's interest in the history of Chinese botany and agriculture began with his delving into the history of cultivated types of Citrus. He soon became broadly concerned with the history of Chinese science, literature and culture, and from 1915 to 1935 cooperated vigorously with Herbert Putnam, learned and far-seeing Librarian of Congress, in building up, within the short space of fifteen years, the most carefully chosen and largest collection of Chinese books in the Occident.

The miscellaneous minor items in the Chinese collection of the Library of Congress consisted until 1898 mostly of uncatalogued and therefore unavailable books. The collection as a whole had not been sufficiently rounded out to cover any special fields and therefore could not be counted upon to serve the needs of special investigators. Nevertheless some of the choice items such as imperial and other gifts, were basically important and highly valued. One of them, for instance, which may have been the first Chinese herbal that Swingle studied, was the classical Pên Ts'ao Kang Mu, edition of 1655, presented to the United States Government in June, 1869, by the Emperor T'ung Chih. The first move to survey the holdings came about through the courtesy of the famous Chinese Ambassador Wu Ting-Fang, who arranged for them to be "catalogued by some of the learned gentlemen connected with the embassy." As a result, the report of the Librarian of Congress for that year included a list of the original 2888 volumes, some of which had been collected personally by Caleb Cushing, the first American envoy to China. Then in 1905 the Chinese Government presented the 1965 volumes which it had exhibited at the Louisiana Purchase

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* Unfortunately there is no assembled official planting of his introductions of Citrus relatives. It seems probable that the most complete collection is at the University of California at Los Angeles. There are some plants at the University of Miami, some at the Plant Introduction Garden at Chapman Field and some at the Fairchild place, The Kampong, Coconut Grove, Florida. There was a good collection in the big orange house at the Department of Agriculture, in Washington, but even before the greenhouses were torn down, many of those were lost. There may be a few at the Glenndale station, but it is doubtful whether there are any at all at Beltsville.

Exposition. There followed, in 1908, when Theodore Roosevelt was President, the gift of a sumptuous set of the Imperial Encyclopedia known as the Tu Shu Chi Ch'êng, in 5041 volumes. This was brought to Washington by a special ambassador and presented in behalf of the Empress Dowager to the American Government as a memorial of China's appreciation of the remission by the United States of the last of the indemnity for the destruction that occurred during the Boxer uprising. It symbolized a new era in the growth of good relations and mutual respect between the two nations.

In the years just preceding this gift, the learned William Woodville Rockhill, American Minister to China, had purchased personally and presented an aggregate of about 6000 volumes, and the Chinese collection was definitely on the way toward becoming one of the important ones in the West.

## Swingle's Development of the Chinese Collection, Library of Congress

From this point its growth until 1928 was guided by Swingle, and his interest continued for many years after that. He had originally been interested in finding that Chinese literature of botany and agriculture contained records of economic plants going back many hundreds of years. The old volumes accessible to him contained references to still older works that either were known to have survived in China and Japan, or might turn up if searched for. So he began an unremitting search for the important works that would supply deficiencies. At first concerned chiefly with the old Chinese herbals and encyclopedic works on agriculture, Swingle quickly turned his attention to the so-called gazetteers that were compiled at intervals for the country as a whole and for provincial as well as lesser subdivisions. These gazetteers actually include not only geographic descriptions but also annals of each general or local administration, detailed local history and biography, records of utilization of natural productions, and of the development of manufactures, reports on official tours of inspection, and such a vast amount of miscellaneous information that they are an inexhaustible mine of facts bearing upon every phase of Chinese culture.

In 1928 Librarian Putnam expressed unstinting appreciation of Swingle's work in his annual report: "From 1910 the collection has been developed systematically, chiefly through the efforts of Dr. Walter T. Swingle, to whose constant interest its present eminence is due. It now numbers over 100,000 volumes (Chinese), unsurpassed outside of China and Japan." In the same report the announcement was made of the appointment of Dr. Arthur W. Hummel as permanent chief of the Division of Orientalia. For eight years Swingle had written the annual reports on Far Eastern accessions, and he continued to contribute them for the botanical, agricultural, and geographical works until 1935.

He was finally in 1947 appointed Honorary Consultant in the Development of the Collection of Orientalia, Library of Congress, in recognition of his long continued and effective labors.

Swingle stands out among the few Americans who have contributed to the history of Chinese science. Especially he gave our botanists an inkling of what they may find in the ancient herbals, encyclopedias and other source books for Chinese economic botany and ethnobotany. In America his influence in this respect was dominant. He exerted it largely through personal contacts, but also through his long series of individually brief but highly effective contributions to the Annual Report of the Librarian of Congress. These enumerated the most significant Chinese, Korean, Japanese, Mongol, Manchu and Annamite accessions, with his inspiringly enthusiastic annotations. They became known to his botanical friends and colleagues not so much through consultation of the whole volumes, which, one fears, are seldom opened except by professional librarians and bibliographers, but through his author's separates. As a whole they bulk largely enough so that if they could be reprinted they would make a uniquely useful volume on the history of botany in China, extending into the history of Chinese literature, which might well be concluded by his contribution to Bishop and Koegh's "Essays Offered to Herbert Putnam."

## Swingle as Exponent of Chinese Civilization

As one looks through Swingle's reports consecutively he is not only impressed by the rapid expansion of their author's interests from Chinese botany to Chinese culture in general but also by his ability to transmit his enthusiasm to others. He passed it on to intimate friends in the Bureau of Plant Industry and to persons whom he never knew except through correspondence. One of his most efficient collaborators was his intimate friend Mr. O. F. Cook of the Bureau of Plant Industry, who, in 1919, travelled widely in China investigating cotton culture. With the help of his assistant, Mr. Yeh Yuen-Ting, and building up a special part of the collection which was already notable, Mr. Cook secured no less than 108 official gazetteers in 1239 volumes. As a result Swingle was able to report with pride that "the Library of Congress now [1920] contains the largest collection of official gazetteers to be found outside of China." In the same year a beginning was made in copying valuable selected manuscripts in the great library of Canton, by a professional Chinese copyist. He had also enlisted the cooperation of the great Orientalist of the Field Museum of Chicago, Berthold Laufer, in the acquisition of Mongol books. Laufer had placed botanists under a lasting obligation to his scholarship by the publication of his "Sino-Iranica: Chinese Contributions to the History of Civilization in Ancient Iran, with Special Reference to the History of Cultivated Plants and Products" (Field Museum of Natural History,

Chicago, 1919) and was one of the few who had a proper appreciation of Swingle's efforts in behalf of the Library of Congress.

In 1921 especially good Korean accessions were made through Dr. James S. Gale of Seoul. In the same year a fruitful cooperation developed with the Nanking University, one of the American Christian Colleges in China. Swingle in fact contacted all of the Christian Colleges, urging them to index individual Chinese works and collectanea in selected fields, and to start library schools following American models. He arranged for Professor Harry Clemons, Librarian of Nanking University, to visit Washington and "to bring into final form the catalogue of what is easily the largest and best collection of Chinese "ts'ung shu" [collectanea, — reprints of rare books long out of print and unavailable separately] outside of China and Japan."

The next cordial collaborator (1922-23) was Dr. U. Y. Yen, director of the educational bureau of the Chinese Ministry of Education. In the same year Swingle turned over to the Library of Congress a beautifully executed manuscript copy made for him in Japan in 1915 of the "Chü Lu" by Han Yen-Chih, written in 1178, the earliest treatise on the citrus fruits in any language. This was made from a copy which was one of the treasures in the private library of Professor M. Shirai of the Imperial University of Tokyo, the well-known historian of Chinese and Japanese botany.

In connection with this we find the first mention in the Library reports of Mr. Michael J. Hagerty. He was an employee of the Library of Congress who was intrigued by the ease with which Chinese read and understood their multitude of printed characters. Concluding that there could be no insuperable difficulty about learning to read Chinese, Hagerty began to apply himself, about 1912, to the study of reading, of course not speaking, and largely without instruction. His success enabled him to do much cataloging and translating of Chinese sources for Swingle, so he was transferred to the Bureau of Plant Industry as Chinese translator. Swingle was extremely pleased with Hagerty's exploit of translating Han Yen-Chih's ancient book on citrus fruits so satisfactorily that Professor Pelliot, the eminent French sinologist and editor of T'oung Pao, asked to publish it in that journal. It appeared in 1923 with introduction and notes by Pelliot himself.

Mr. T. L. Yuan worked as Chinese cataloger for three years after studying at the Albany State Library School and at Colombia University, before returning to China, where he helped in finding desiderata for the Library of Congress. He became librarian of the Metropolitan Library of Peking and sent various useful books as gifts.

As for these "ts'ung shu", incredibly extravagant though they may have been as publications in comparison with reprints of single works, their great initial cost insured that they would be well taken care of, and they did therefore preserve ancient works that would otherwise

have been lost. The bulkiest of them all, the "Yung Lo Ta Tien" had the objective of including all "serious works" of Chinese literature extant in 1400, excluding novels and plays. It comprised 11,095 volumes, and was never printed. It existed at first in just the original draft and one final copy. Later a new copy was made. Swingle said: "Some 8000 years' labor of scholars was spent in compiling, copying, and proofreading the original work, and that of another 2000 years, first and last, in making copies and transcripts." Only scattered volumes have survived, so far as known, of which the Library of Congress has 33, and in 1922 only the Library of the Chinese Ministry of Education had more, holding 60. A historical study of the "Yung Lo Ta Tien" by a Chinese scholar, Sun Chuang, is to be found in the Library of Congress collection. A dedicatory foreword says that during a visit to Peking, Shih Yung-kao [no other than Walter Tennyson Swingle!] had recognized the value of the work and had urged that a copy be made for the Library of Congress. The obliging author complied, and sent it with the annotation that the task of copying had been completed on the twentieth day of the tenth month of the seventh year of the Chinese Republic (Oct. 20, 1918). It had probably been started in 1915, when Swingle visited China.

Swingle was a member of the official delegation to the Pacific Science Congress held at Tokyo in 1926, and was able to visit China and Korea as well as Japan. So, as might have been expected, it was a banner year for the acquisition of Oriental books. Much help was given Swingle by former friends and benefactors of the Library of Congress, such as Professor Shirai of Tokyo, Librarian T. L. Yuan of Peking, and Professor Harry Clemons of Nanking, but gifts of unusual interest and value were presented by Dr. Philip T. Y. Sze and Chang Chin-Ch'eng, retired general manager of the Commercial Press, Ltd., of Shanghai, then perhaps the largest book publishing house in the world.

Enough names have been mentioned to indicate the nature of the contacts by which Swingle proceeded in building up the Chinese library, but his responsible leadership of the enterprise, as already noted, ceased in 1928, with the appointment of a Chief of the Division of Orientalia, and his contributions to the Annual Report of the Librarian of Congress in 1935.

By the time of the incorporation of a single great miscellaneous accession, that of the Wang family library (1928-29), which brought the number of Chinese volumes in the Library of Congress up to more than 125,000, Swingle had got to the point of writing in this vein: [The Chinese have] "the oldest continuous civilization of high standard to be found in the world today. They are, moreover, a people having a strong historical sense and an age-old custom of recording clearly and fully every detail relating to administrative procedure, as well as to everything concerning the geography, transportation, products and industries of their vast empire. They are, furthermore, a people

Fig. 3. Walter Tennyson Swingle and the Japanese plant pathologist S. L. Kuwana, 1 October 1926. Dr. Swingle was in Japan as a delegate to the Third Pacific Science Congress at Tokyo.

who, perhaps more than any other people in the world, have the keenest possible interest in family history, biography, genealogy, and in the writings of their great scholars. Western scholars, in spite of all the good work they have done in the study of Chinese have barely scratched the surface of this field. Until after the revolution of 1911 foreign scholars had practically no access to any important Chinese official or family library."

If it had been possible within the capacity and life span of a busy professional man, Swingle would have plowed deeply, not merely scratched, the whole field himself. He could only hope that possession of this great national treasure by the United States, a library epitomizing the civilization of China, might attract the gift of an endowment "to insure the active and efficient utilization of these books which are the best and most trustworthy records of the attainments, the aspirations, and the hopes of the Chinese people."

There have been dark days for the perpetuation of Chinese civilization before the present era of calamity. Back in 221 B. C. the emperor Shih Huang Ti, despotic founder of the Ch'in Dynasty, ordered the destruction of all books except those on medicine, agriculture and

divination. The books were hidden away, however, and when the edict requiring the destruction of literary works was repealed in 190 B. C., everyone was encouraged to bring forth the ancient books. The formation of a great Imperial Library went forward. By 124 B. C. the restoration and study of the classics was provided for in the Chinese prototype of a university.

Needless to say, living tradition will bridge the gap of a generation in maintaining the continuity of Chinese civilization, quite regardless of how thoroughly the apostles of Stalin may try to stamp it out. Nevertheless, the tidal wave of cultural destruction may sweep so clean that the Chinese Collection in Washington may come to have great importance in the Chinese cultural renaissance to which we shall look forward, and for which we should help to prepare by making the Library of Congress a haven of refuge for Chinese scholars of the old tradition.

Swingle was such an enthusiast about Chinese botanical and agricultural literature that he never lost an opportunity to tell all who would listen that encyclopedias were apparently a Chinese invention, maybe older than the Chinese art of printing from engraved wooden blocks; that incorporation in great reprint collections, seemingly a wasteful type of publication, saved many valuable individual works from oblivion; that the author of an illustrated work on Chinese agriculture, Wang Cheng of the Yuan dynasty, may have been the first to make extensive use of movable type; that Ts'ai Lun, who laid his invention of paper before the throne in 105 A. D. and revolutionized book production was thereby the greatest of all practical technologists in utilization of botanical products whose name as an individual survives in world history; and that the printer's art "from the manufacture of paper, printer's ink, blocks for printing, and movable type, both engraved and cast, as well as printing presses themselves, were all invented by the Chinese and used by them centuries before they were used in any other country. It is no exaggeration to say that printing on paper is the basic art of civilization, without which civilization itself could not exist in its present form."

"In agriculture," he wrote, "the Chinese have distanced all other peoples in finding crops adapted to every type of soil; where we drain land they plant crops adapted to wet soils; where we lime the soil they plant acid-soil crops! They seem to have been the first to write monographic studies on flowers, fruits, grains, tea, and a host of other plants. They attained great skill ages ago in diagnosing diseases and in curing diseases by complex balanced drugs. We are only now beginning to appreciate, since we have adopted ephedrine and chaulmoogra oil derivatives, that Chinese drugs are not necessarily quack remedies of no medicinal value. More than sixteen hundred years ago Chi Han, in his 'Nan fang ts'ao mu chuang', the oldest Chinese botanical treatise extant, gave a striking instance of the so-called biologic control of insect pests of crop plants by colonizing fruit trees with voracious

stinging ants that drove all other insect pests away. Only a few years ago I had the good fortune to assist from afar in the discovery of a village in south China where these ants were still grown and sold to the orange farmers, just as described ages ago in accounts not before given credence in western countries . . . In foods we have everything to learn from the Chinese who support life on one cent a day and have worked out by centuries of experience, tasty, digestible, and nourishing dietaries of ridiculously low cost. They have discovered literally scores of highly nutritious and extremely tasty preparations made from the soy bean such as milk, curd, cottage cheese, fermented cheese, sauces like the famous soy sauce — in fact a whole shop full of products, while we are barely able to utilize the soy bean for human food and in fact usually do not use it for human food at all." Some derided Swingle's enthusiasms as evidence of credulity, but he pursued them indefatigably to ultimate scientific gain and practical benefit.

Swingle's participation in building up the Chinese collections in the Library of Congress was one of his major accomplishments. That collection may well become one of the chief repositories through which Chinese culture will survive the pestilential scourge of Russian communism. If so, Swingle and Putnam will have built better than they could have known, for there must be much in the age-old Chinese culture that the world will again need when the present tidal wave of barbarism shall have spent itself.

Sometimes Swingle's enthusiasm for things Chinese caused his hearers to smile incredulously, but he could put up a strong argument for retaining almost any venerable Chinese institution, or at least making sure that it did not pass away without the most searching scientific appraisal, and then by a process of evolution. Most persons were inclined to think that China did well to modernize in giving up the ancient system of examinations in the classics for appointment to official positions. Swingle thought otherwise. He pointed out that by the old system selection of major officials was strictly competitive and all were eligible for the qualifying examinations. Everyone who passed was assured of appointment. There was no preference list, no deferment, and no favoritism. Officials never served in their own districts, where they might be called upon by family and friends for favors that should not properly or justly be granted. If they became corrupt, it was then through sheer human fallibility. As a result of having a civil service based upon examination, open to all, for which the best brains of China were sought out, every locality, no matter how rude or underdeveloped culturally, had officials who were learned men.

In his thinking Swingle was characteristically capable of jumping a startlingly wide gulf, for his mind did not always follow a smooth path of transition, and he could turn all of a sudden from the selection of civil servants to the geography of book publication, in the end relating the two subjects quite satisfactorily. He was fond of saying that in old

China a printing establishment could be set up by merely cutting down the nearest wild pear tree, and then having the village carpenter make uniform smooth blocks of the wood. Processes that followed were pasting carefully prepared manuscript face down on the blocks, cutting the wood away to leave elevated characters or illustrations, as a type face, and finally, printing. This could all be done in one place as well as another, so there was never any centralization of printing in old China. With scholars widely dispersed as a result of the civil-service policy, with every scholar anxious to make a name for himself in literature, and with equally good facilities for publication everywhere, book production was enormous. So, for a thousand years, the rate of publishing books was greater in China than in all the rest of the world put together, and this was true up to the eighteenth century.

Chinese social structure was also defended by Swingle. He was vastly irritated, for example, by those who thought that treatment of aged parents in China was foolish and uneconomic, and that Chinese family life in general was badly arranged. On the contrary, he was in advance of anthropologists of the sociological school in asking: "Does it not seem worth the effort, while this ancient civilization still exists, to see for ourselves what the Chinese have found that is of value for us, especially since by giving them due credit for their discoveries, we benefit them and ourselves by creating a new and stable basis for esteem where at present prejudice, based on ignorance for the most part, rules supreme?" At the same time, he exclaimed: "What a world lies open to us if only we have the sense to study while it can still be studied and to study with an open mind and a sympathetic heart!" So spoke one who was sociologist and humanist as well as botanist. The devastating calamity of Russian-style communism has now overwhelmed China, a country whose people have had more sense of genuine social obligation and have put more mutual helpfulness into practice than the Russians have ever dreamed of.

Swingle was one of the most interesting and useful men of the brilliant foundation period of the U. S. Department of Agriculture. His name deserves a high place on the honor roll of American botanists and humanists.

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## LETTERS ABOUT SWINGLE

David Fairchild
The Kampong, 4013 Douglas Road
Coconut Grove, Florida

March 3, 1952

Dear Bartlett:

Your letter of the 29th brings back all sorts of memories. Among them some very sad ones of Tenny Swingle for the empty space that his going has left in my life is a void that is very painful, for since I was seventeen the letters have passed to and fro and they were always about something that seemed worth while; were never about trivialities.

Ralph Robinson of Terra Ceia and I wrote a short obituary notice of him for the Washington Academy of Sciences and I sent it to Maude yesterday to correct and submit to the Editor of the Journal. I just published a note in our Bulletin of the Fairchild garden here which I will enclose. It is quite inadequate of course. I urged Tenny to publish his memoirs and I think he did begin them. Perhaps Maude will finish them.

As for my own case I will see what I can do, although soon I shall be 83 and my memory is failing.

If Marian can help me we may send you something before long. I dare not promise just when, however.

How is your own health and do you never expect to visit this fringe of the Tropics where we are doing what we can to make the countryside beautiful with palms, flowering trees, and vines?

Its a heavenly afternoon and I have been opening sprouting coconuts to show an audience what is inside of them.

With best regards as always, Yours, D. F.

March 22, 1952

Dear Bartlett:

Harold Coolidge called yesterday and told us of his world (Asian) work and other things.

His call reminded me of my promise to write you something about my since-boyhood friend, Tenny Swingle. I got Ralph Robinson of Terra Ceia to send me films I took at his house years ago and I've sent them to the National Geographic for enlargement to 4x4 inches. When I get them I will attach them to my boyhood memories of one of the most brilliant botanists I ever knew. Ralph was Tenny's intimate friend and associate in his great Citrus work.

I never saw Asa Gray although I did know Farlow; meeting him at the elevator of the old building in Harvard and mistaking him for the "Elevator Boy." My uncle, Dr. Byron D. Halsted, was his first student I believe.

By the way, Mrs. Arthur Hoyt Scott "Todmorden Farm," Media, Penn. came to lunch the other day and told us of her childhood memories spent in the Smokies when Prof. Chas. Sprague Sargent and Asa Gray visited her father in their mountain home there. She sat on Prof. Gray's lap and pulled his whiskers and I think is now the only living person who knew Prof. Gray intimately. Why don't you write her and get a story (child's story) of the Grand Old Man? You may know her of course.

With very best regards

Yours sincerely

David Fairchild

May 18, 1952

Dear Prof. Bartlett:

I am going through Dr. Swingle's published writings and find I knew all too little of his enormous activities. Soon I'll start giving some accounts of the early days of our friendship.

You may be interested to know that our daughter Nancy and her distinguished biological husband Marston Bates and their four little children are soon to settle down in Ann Arbor and join your staff. I trust they will meet you and I feel sure that their lives will be happy ones in what I have always heard was one of the most interesting communities in America.

When I was twenty I became acquainted with President Angell and

with his beautiful mother who was visiting Geneva, N. Y. at the time when Peter Collier was director of the Experiment Station there and Mrs. Collier invited me often to the quarters above the Station.

There I met her daughter and heard her play, as she did very beautifully, on her piano.

With kindest regards I remain

Very sincerely yours

David Fairchild

# THE SWINGLE RESEARCH PROJECT AT THE UNIVERSITY OF MIAMI: ONE ASPECT OF THE "NEW TAXONOMY"

UNIVERSITY OF MIAMI

CORAL GABLES (University Branch) 46, FLORIDA
Swingle Research Project
Botany Department

February 25, 1952

Dear Mr. Bartlett:

Mrs. Walter T. Swingle wrote today saying that you were compiling a biographical sketch of Dr. Swingle to appear in the Asa Gray Bulletin, and asking that I send to you some information on the Swingle Research Project here, and data concerning Dr. Swingle's technical library.

We have attempted to compile a complete list of Dr. Swingle's publications, and at present this list contains 256 items. It has been compiled from a great many sources, but probably is not complete as Dr. Swingle's writings were printed in so many different periodicals. We do feel sure that it contains the bulk of the significant papers. I am enclosing a copy of this list, and hope it may be of some assistance to you.

Dr. Swingle arranged to turn his technical library over to the University of Miami, and the bulk of it was transferred to the University Library in December, 1951. These materials are still undergoing processing, accessioning, etc. at the library, and so final figures on the size and value of the collection have not yet been completed; the collection contained between 17,000 and 20,000 volumes, many of which are virtually unobtainable today.

Early in 1948 Dr. Swingle suggested that the University maintain as nearly a complete arboretum of Citrus and Citrus relatives as possible, as many of the genera and species which he had so painstakingly assembled while preparing "The Botany of Citrus and its Wild Relatives of the Orange Subfamily" were being lost. The University accepted this suggestion, and at the present time 18 of the 33 genera included in the Aurantioideae are being grown and maintained at the University. We plan to continue and enlarge this collection, the objectives being to have eventually as complete a collection of the genera and species as possible. Already this collection has proved useful for identification of varieties, to persons interested in rootstock experiments, and in several phases of experimentation concerning Tristeza disease.

When Dr. Swingle became Consultant in Tropical Botany at the University of Miami in 1941, he was engaged in the completion of his taxonomic monograph on the Citrus sub-family; this work was, as you are probably familiar, done in collaboration with the U. S. Dept. of Agriculture, and technical facilities and an assistant, Dr. Albert H. Tillson, were provided by the Department at the Glenn Dale, Md., Station for the work. Dr. Swingle had found so many of the type specimens of these plants so fragmentary that he adopted a technique developed by H. O. Juel for "restoring" critical portions of a herbarium specimen so that the resulting restored specimen could be sectioned by the paraffin method and made into permanent slides suitable for microscopic study. This method made possible the easy separation of genera and species formerly in doubt, as anatomical and morphological characters of the flowers and fruits were clearly established. Dr. Tillson compiled a reference collection of over 250,000 serial microtome sections in the course of this work.

Dr. Swingle was so impressed by the effectiveness of the method and by the aid it provided in establishing characters of taxonomic importance in the Aurantioideae, that he urged the University of Miami to undertake a long-range project to compile a reference collection of slides of serial sections of the critical parts of all tropical economic plants and their wild relatives. The collection was to be used in general anatomical and morphological studies, and as an aid to taxonomic studies of tropical economic plant groups.

The University saw the value of establishing such a reference collection of slides, and also of conducting investigations based on the reference collection, and so began in 1942 what is now known as the Swingle Research Project. I had been Dr. Swingle's assistant as an undergraduate student at the University, and was sent to Glenn Dale to learn the techniques of Juel which had been perfected by Dr. Tillson; the project was begun on a full-time basis in 1943. At the present time the reference collection of slides encompasses over a

million and a half serial microtome sections, all of which are permanently mounted and filed here; this collection represents some 40 plant families. As an outgrowth of this project we are at the present time engaged in basic anatomical and morphological studies, as well as taxonomic investigations.

The project maintains its own reference library in the fields of Plant Anatomy, Morphology, and Taxonomy, and includes over 4,000 titles at the present time. This collection is being rapidly expanded.

If I can be of any further help to you in your preparation of the biographical sketch, please feel free to call upon me. I should be delighted to have several copies of the number of the Asa Gray Bulletin in which your article appears.

Sincerely,

Frank D. Venning,
Research Assistant Professor

## AN INTERESTING SERIES OF POPULAR ARTICLES ON PALMS CULTIVATED IN FLORIDA

AN INTERESTING SERIES OF POPULAR ARTICLES ON PALMS CULTIVATED IN FLORIDA — Inquiry was made to the Miami Herald to find out who had written the sympathetic and understanding obituary of W. T. Swingle which appeared in that paper. It was by Nixon Smiley, their Farm and Garden Editor, who writes the Herald's excellent horticultural page. The "Herald" is currently running Mr. Smiley's illustrated articles on the cultivated palms of Florida. These should ultimately be assembled for republication in a more permanent form. They would do much to increase popular knowledge of one of the most interesting families of plants, and one which is unfortunately too much neglected even by botanists. The originality and quality of Mr. Smiley's page is well illustrated by the Herald's issue of March 9, kindly sent me by Mrs. Maude K. Swingle, which has a leading article in the form of a greeting to Wilson Popenoe on his 60th birthday. Popenoe's name will come to be associated with that of Fairchild in the field of tropical horticulture, for although Popenoe has devoted himself to many good works he is perhaps thought of especially in connection with some of Fairchild's favorite introductions, choice varieties of mango and avocado. Smiley's article appeared exactly on Wilson Popenoe's birthday! Such commemorative foresight is most unusual, but it was stimulated by a very unusual man. We join belatedly in wishing Popenoe many more productive years. — H. H. B.

# THE GARDEN CLUB OF AMERICA AWARDS ITS ACHIEVEMENT MEDAL OF 1952 TO MRS. ROY ARTHUR HUNT

AT its recent meeting in California, the Garden Club of America awarded its "Achievement Medal of 1952" to Mrs. Roy Arthur Hunt of Pittsburgh. This highly deserved honor will please her numerous friends so much that the citation is quoted in full below.

"Achievement is a noble word. The Garden Club of America regards its Achievement Medal as a noble award. It takes high pride in signaling out members who merit this honor. This year it takes a pride in the recipient of this award equalled only by its love for her, for Mrs. Roy Arthur Hunt of Pittsburgh, whose record of scholarly accomplishment is a delight and incentive to horticulturalists the wide world over. Mrs. Hunt has the distinction, moreover, of being a prophet with honor in her own country. Just to mention her name to a resident of Pittsburgh proves an open sesame. Her native city is as proud of its distinguished "Daughter of the State of Pennsylvania" as is the Garden Club of America.

"Active in the Garden Club of Allegheny County and in the Garden Club of America as director and Chairman of various committees, Mrs. Hunt has since 1939 edited the Department of Garden Literature of the Bulletin of the Garden Club of America.

"Her discrimination in choosing books and manuscripts has proved an invaluable asset in the formation of her noted botanical library. This library is a recognized contribution to botanists and scholars not alone in the United States but throughout the world. The Grolier Club of New York, the Baltimore Museum of Art, the Clements Library, the National Gallery of Art, are but several among many institutions that have exhibited selections from her collection. To give but one example of the practical use of this collection, the Clements Library selected fifty-five rare books for the specific purpose of illuminating the history of botanical illustration from the earliest printed books down to 1800.

"It is not alone by this rare collection that Mrs. Hunt has won recognition, but, above all, by her evaluation and interpretation of what she has collected. She has lectured at such distinguished institutions as the Massachusetts Horticultural Society, the National Gallery of Art, and the Metropolitan Museum. And lovingly and generously she has shared botanical books, flower prints, and original drawings with Garden Clubs everywhere. To quote Mr. John Walker of the National Gallery of Art "in her special field of bibliographical research and in her connoisseurship of flower prints and drawings, Mrs. Hunt has few peers in America or Europe."

"Believing that this work of scholarly research and the promotion, thereby, of botanical knowledge throughout the country is of national value, and desiring fittingly to honor an achievement so intimately related to its own aims and purposes, the Garden Club of America presents the Achievement Medal for 1952 to Rachel McMasters Miller Hunt."

Mrs. Hunt was in California for the meeting but had not been too well before leaving, and had the misfortune to have her visit there marred by illness. She writes as follows:

4875 Ellsworth Avenue, Pittsburgh 13, Pa.
May 29, 1952

Dear Mr. Bartlett,

I am sorry I have been so remiss in answering your letter about the separates. They will do perfectly well for my purposes, and I know how difficult it is sometimes to let things go out of print. I think your Bulletin is going to be a valuable thing, and Volume 1, No. 1 will no doubt be much sought after. I am proud to have the review of my Catalogue too, in No. 1.

As for the check, that is "gone with the wind." I want you to use it for the Asa Gray Bulletin . . . That will help a little toward the complimentary copies that you sent out.

I have not quite recovered from virus flu which I had in California, and I am surrounded by grandchildren. My Philadelphia son and daughter-in-law and their three little boys have moved back to Pittsburgh, and they were in our house about a month and a half while their house was being made ready for them. So life has been rather hectic for me, and at the moment I am enjoying the idea of not having a single plan for the summer but to stay here and enjoy the gardens and the temperate Pittsburgh summer.

Sincerely,

Rachel Hunt

# TOM MUZIK WRITES FROM PUERTO RICO*

Federal Experiment Station
Mayaguez, Puerto Rico
March 7, 1952

Dear Professors Bartlett, McVaugh, et al.;

Your project of a revived Asa Gray Bulletin sounds interesting and I am enclosing a check. . .

I am still enthusiastic about the tropics as a place to do research. There is a wealth of interesting and exciting plant material. The family like it too. Peggy enjoys having a maid to do housework and the children can play outside most of the year, without the need for winter clothing. There are very few mosquitoes or bugs of any kind, and no poisonous snakes or wild animals. In this respect, it is much different from Liberia, where the children had to be brought inside at four o'clock because of the mosquitoes and the danger of malaria. We often have late picnics here with very little trouble from insects. The numerous bathing beaches are the best feature of Puerto Rico. Many of them are lined with coconut palms and the water is exceptionally clear. Wearing a pair of goggles, it is often possible to see the bottom plainly through twenty feet depth of water. Incidentally, one of the finest sports in the world is spear-fishing around the reefs. The under-water scenes are lovely, with huge sea-fans, grotesque coral formations and multi-colored fishes. It is necessary to wear shoes and gloves to avoid scratching oneself on the sharp coral. Last time I was out, I nearly tangled with a large barracuda, about six feet long. I was in about five feet of water and this fish, which is about half mouth with extraordinarily long wicked-looking teeth, came up behind me and then circled me three times, trying to decide whether I was edible or not, I suppose, and then shot off into deep water. My friends have never been attacked by this fish although we have all seen them frequently.

I find the climate to be very comfortable. Puerto Ricans love flowers and all of the roadsides have been planted with shrubs and flowering trees. The flamboyant is especially magnificent in season. Even the houses are painted with pastel pinks, blues, greens, etc and

*Thomas J. Muzik took his Ph.D. at the University of Michigan in 1950, and was a graduate student under Professor Carl D. La Rue both before and after an interesting experience in Liberia, where he was employed on the great plantations of the Firestone Rubber Company. He worked there on regeneration phenomena and other matters connected with the propagation of Hevea rubber, and his dissertation was in that field. He is deeply devoted to tropical research in the physiology of economic plants.

are very colorful. Most of them are made of cement to avoid termite damage.

If the old saying "God must love the poor, he made so many of them" is true, then He must be especially fond of Puerto Rico. The island is dreadfully overpopulated and the number is increasing by leaps and bounds, for Puerto Rico has one of the highest birth rates in the world. This is a very serious problem. To maintain even the present low raio of available goods to people, a constant increase in production is necessary. Like Alice in Wonderland, it is necessary to run as fast as one can, even to stay in the same place! Our contribution so far has been to introduce public health measures which have substantially reduced the death rate. I have always thought human dignity and grinding poverty to be incompatible but somehow nearly everyone is courteous, friendly, helpful and very polite. The cost of living is higher even than in Ann Arbor, believe it or not! All the food must be shipped in, since nearly all of the land is devoted to raising sugar cane. Coffee, tobacco and cotton are also exported. Rice and beans form the major portion of the native diet.

I am doing research only, no teaching. I occasionally regret my lost classes, for I enjoyed teaching very much, but the opportunities for research are very good here. My work consists of the study of basic aspects of the action of herbicides on plants, especially on nut-grass, Bermuda grass and velvet bean, studies on plant differentiation in the tropics and the propagation of Hevea rubber. It is all extremely interesting. My laboratory facilities are excellent. I have two assistants, one a college graduate and one who has had two years of high school. They are both very good. When Dr. La Rue spent his sabbatical leave here last year, we did some grafting of large monocotyledenous plants, including bamboo, sugar cane, elephant grass, guinea grass and some of the big tropical lianas. We also did some work on mangroves. . . Many interesting plants have never been studied and the problem here is to select material carefully so as not to get involved with too many things.

I am enclosing an abstract of some recent work on nut grass and some reprints which will give you a pretty good idea of what I've been doing. We also have an article in the February issue of Agronomy Journal which has just arrived.

Sincerely,

Tom

# A BOTANICAL EXCURSION TO THE SIERRA MAESTRA (ORIENTE PROVINCE, CUBA)

Grady L. Webster

DURING the summer of 1951, when Roy Jervis and I were in Cuba collecting plants for the University of Michigan Botanical Gardens, we intended to explore not only the serpentine ranges in extreme eastern Oriente province (although that was our primary interest) but also to take a trip into the Sierra Maestra. This is the mountain range running west of the city of Santiago, rising steeply from the Caribbean to the highest peak in Cuba, Pico Turquino (altitude about 2,000 meters). This mountain was apparently first ascended in 1915 by the celebrated Swedish botanist Ekman, although, as will be mentioned later, there has been some controversy on this point. Roy and I had naturally thought of making a trip up this mountain, since it has a fine altitudinal belting of vegetation types, from lowland dry scrub at sea-level to cloud-forest at the top.

When we arrived in Santiago, therefore, we got in touch with Dr. Pedro Cañas, who is professor of geology at the University of Oriente and an active member of the famous Humboldt Group ("El Grupo Humboldt, Sección de Excursiones de la Sociedad de Geografía e Historia de Oriente"). This group of mountain-climbers and explorers had in 1942 scaled the second highest peak in Cuba, La Bayamesa (1700 meters high), for the first time, but no botanists were along and no botanical collections were made on the summit. The ascent of La Bayamesa immediately presented itself as a worth-while endeavor which would be a fitting climax to our summer's expedition.

To further this plan, Dr. Cañas then introduced us to the secretary of the Humboldt Group, Mr. C. D. Bingham, who invited us to his home for lunch and entertained us with an excellent meal and enlightened conversation. Although it was a rainy afternoon, Mr. Bingham showed us around his yard to look at his collection of Cuban plants, of which he was justly proud, and we took specimens of some particularly interesting species. Furthermore, he gave us a letter of introduction to the caretaker of his "finca" (plantation, in this instance a coffee plantation) near the village of San Pablo de Yao at the foot of the Bayamesa, and a map showing how to climb the peak. It was from Bingham's finca that Dr. Cañas, Bingham, and other members of the Humboldt Group had departed on their now historic climb.

We reached the town of Bayamo late on the evening of August 14 and registered at the Hotel New York. From the very first, Bayamo

impressed us more favorably than most Cuban towns we had seen. As we parked at the town square, a friendly policeman came over and assured us that he would watch our jeep to see that it wasn't harmed. After we had had a late supper of fish, riñones (kidneys), corn fritters, "plátanos maduros" (ripe fried plaintains, delicious when properly done), and a delicious "postre" of sweetened grated cocoanut, we felt quite content to go out and briefly watch the promenade of pretty girls around the town square before retiring. The glory of a proud history seemed to be the secret of Bayamo's attractiveness; we discovered everywhere markers testifying to the part the city had played in the uprising of 1868, which formally initiated the Cuban struggle for independence. Carlos Manuel Céspedes, the leader of the revolution of 1868, and Thomas Estrada y Palma, the first president of the Cuban republic, both came from Bayamo, and it was here that the initial pitched battle between Spaniards and Cubans resulted in the firing of the town by the insurgent forces, the famous "Incendio" of 1868. Today the citizens of Bayamo have a proud, free-spirited bearing which is not to be seen in the towns around Havana.

From Bayamo it is perhaps a forty mile trip, only a part over paved roads, to the terminus, San Pablo de Yao. The morning of the 15th we arose leisurely (in accordance with prevailing custom), did some shopping, and finally left Bayamo shortly before noon. We drove through the undulating sugar-cane country toward the inviting bluish heights of the Sierra Maestra, which stretched entirely across the southern horizon, and all went well until we reached the village of Bueycitos. We had by now left the pavement and here the villagers assured us that the road to San Pablo de Yao was absolutely impassable by jeep. Since it had rained heavily the day before, we were not really surprised, for we knew only too well how miry the soil of the sugar-cane country became when wet. We pondered for a while in indecision, wondering whether or not to give up the attempt entirely. But by now I had a positive obsession to climb La Bayamesa, and when some villagers said that a "comando" would soon be coming through on its way to San Pablo, I decided to go on that. So Roy and I for the first time split up the expedition; I took from the jeep some of the plant presses, a bottle of formalin for preservative, and most of the canned goods. When the "comando" arrived there was no little difficulty in lashing these things on the back and sides, and the car was so crowded that I had to ride on one of the fenders. It was very interesting to see what an integral part of the Cuban transportation system the demilitarized U. S. Army Command Car has become; it has almost offset the misappropriation of public works funds by Cuban politicians. It operates in many parts of rural Oriente where even the intrepid and uninhibited Cuban drivers cannot take a conventional bus.

San Pablo de Yao turned out to be a row of three or four general stores and a few scattered houses. I got off at Casa Pinilla, which was a very respectable general store such as used to exist in many

rural parts of the United States, and handed my letter of introduction to Rafael Pinilla, the proprietor. He dispatched it by bearer to Luco Sancesareo, the caretaker of the finca, which was about five kilometers upstream on the Rio Yao; I left the luggage with Pinilla and walked up the river, having a guide the first couple of kilometers but thereafter asking the way. Finally, at a sharp turn in the river after what seemed like at least ten kilometers, there was a "bohio" — the typically Cuban thatched hut often made entirely of the leaves of the royal palm — and sitting in the window a really attractive Cuban girl. A little startled at this incongruous combination, I managed to blurt out the formula Bingham had suggested: "¿Donde está la finca del americano?" With really queenly bearing she made it plain that it was just across the next ford, and that I was a little stupid for asking such an obvious question. Sure enough, a hundred yards or so beyond was a little concrete house with a thatched roof, set well back from the "road" and almost swallowed up in the luxuriant vegetation which sprawled over the steep hillside. Luco, a thin, spare, dark-haired man, came out to greet me and sent his two boys off to town for the equipment. It was by now sundown; over supper we agreed that the day after the morrow we would start for the Bayamesa, a day being necessary to make preparations.

The next day (August 16) I collected around the steep hillsides above the finca, not finding much in the way of native vegetation since much of the land was planted in coffee; the considerable harvest in mosses (which I had promised to collect for my friend Howard Crum) was, however, sufficient compensation. In the evening we all (for the neighbors had come over) listened to the radio, which was no doubt the only one in the neighborhood. It was a historic occasion, for Senator Eddy Chibás, the leading candidate for the oncoming presidential election, had died as the result of a pistol-wound self-inflicted at the close of one of his Sunday afternoon political speeches. Out in this remote area of Oriente province the people seemed to feel that Chibás was their brightest hope for cleaning house in the national capitol at Havana, and that his death was a real tragedy. In Oriente this summer there seemed to be widespread resentment against the central government in Havana, which everyone said swallowed up Oriente's taxes and gave nothing in return.

The morning of August 17th we were to leave for the Bayamesa by sun-up. I woke up about 5:00 a.m. to find Luco and some others listening intently to the radio. The announcer was saying that a storm was coming across Jamaica and Haiti. Luco, shaking his head, said that the climb was quite out of the question, for we would be in very bad shape if the storm hit while we were up on the peak. I argued this point at some length, for it appeared that the storm might miss Cuba entirely, as indeed it did, but finally agreed that it was too much of a gamble.

Instead of the great expedition up the Bayamesa, then, I, my "pratico" (guide) Ventura, and a "muchacho", went up over the steep ridge on the east bank of the Rio Yao. The ridge was barren and grassy and most uninteresting botanically; a few scattered trees of Ouratea americana (Dilleniaceae) looked and acted the part of live-oaks. At the top of the ridge were coffee groves and scattered bohios, and not until we descended into the valley of the Río Oro did we see any native vegetation of interest.

The Río Oro itself was a delightful spot. Swift, cool water ran over large boulders of igneous rock, and a lush forest full of mosses, ferns, begonias, and peperomias came down to the water's edge and sprawled over the wet rocks. Pitcairnia cubensis, the only conspicuous terrestrial bromeliad in this country, extended its bright red-flowered sprays from steep banks. Meriana leucantha, a shrub with neat glossy triplinerved leaves and numbers of waxy white flowers with pink stamens, was the most attractive of the several Melastomaceae. I was delighted to find growing on a rock at the edge of the water a plant of Phyllanthus maestrensis, a rare species known only from the type collection made by Ekman on the Río Oro, possibly at this same spot. Definitely a mesophytic species, it contrasts strongly with the xerophytic Phyllanthi of the Baracoa region in relationship as well as structure, for it belongs to a widespread section, whereas the xerophytic Orbicularia group is mostly endemic to Cuba. In this respect it typifies the flora of the Sierra Maestra as a whole, which is composed largely of species ranging rather widely in the West Indies, as contrasted with the markedly endemic flora of the older serpentine ranges in the eastern half of Oriente.

Unfortunately, vegetation such as I have just described was present only in a few oasis-like spots along the Río Oro; most of the hillsides, even very steep ones, had been cleared for maize and cassava planting. Where cleared fields had been left along a rank shrubby growth dominated by Cecropia took over, although here and there you might see a few tree-ferns incongruously maintaining a foothold among the ruderal species. Everywhere there were signs of recent and indiscriminate clearing, and it will not be very long before the native vegetation of the foothills will have been almost entirely removed.

I was a number of times astounded by the perspicacity of my "pratico" Ventura. Dressed in rags that gave him a somewhat wild appearance as though he might have been one of Pancho Villa's gang, he nevertheless had a mild disposition and a keen eye for plants; he brought in a number of striking species that otherwise I would probably have missed.

After narrowly escaping being caught in a rain-storm, we returned to the finca at only 2:00 P. M. but it required the rest of the afternoon to order up the plant collections, especially since Ventura kept bringing in additional specimens. While painting the plants with formaldehyde,

I had as an audience all the unengaged individuals in the neighborhood, — that is, nearly everyone.

The next day it rained almost continuously, and I was able to make a sortie only in the late afternoon. This left only the following day (August 19) for field work, if I were to meet Jervis in Bayamo on schedule. I decided to spend the last day at the closest good stand of pine, which, it appeared, was about five kilometers upstream at the confluence of the Río Yao and Río Jagüey. Ventura and I, with a different "muchacho" made up the party. We forded the Yao many times before reaching the Jagüey. The "main highway" was only a trail running along the rocky streambed.

The pinal (pine woods) turned out to be situated on the crest of the ridge between the two rivers, at an altitude of perhaps 500 meters. After stopping at a "bohio" to have black Cuban coffee with some acquaintances of Venturas's, we struggled up the hillside through a dense jungle of Phytolacca icosandra, which was a worse nuisance than any pokeweed I remembered seeing in the United States. The pinal was rather barren at the ridge-top, and it seemed at first that the climb had scarcely been worth the effort. Since Jervis was interested in the Cuban pines, I collected a couple of sheets just for a locality record; after we returned to Michigan, it turned out that this pine which was collected so casually was not the typical Pinus cubensis which is supposed to cover the mountains of Oriente. Like a specimen Jervis collected a few miles west of here, it had thin flexible needles quite unlike those of the Pinus cubensis we saw elsewhere. Jervis is going to describe it as a new variety of Pinus occidentalis, a species heretofore considered to be restricted to Hispaniola. This is a good reminder not to pass up collecting plants because they seem too common, expecially in dealing with a group in which the species are as finely drawn as in the slash-pines!

Leaving the pinal, we descended into a steep shaded ravine full of palms and some interesting ferns such as Dryopteris formosa, Bolbitis nicotianaefolius, and Danaea elliptica. Ventura again endeared himself to me by bringing up a sprig of a large Lobelia, which turned out to be Lobelia assurgens var. santae-clarae, here perhaps collected for the first time in the Sierra Maestra. It was a truly bizarre looking plant, mainly because of the decurrent stipules which make four conspicuous green wings down the stem. With this prize, we turned back down hill and down stream.

As a sort of going-away celebration, Luco cooked some "jutía" for supper. The jutía is the largest native Cuban rodent, and is generally considered a delicacy. Luco cooked it in rum, and it was, even if overly greasy, very gamey and palatable. It made at least as big an impression on me as did my canned Boston brown bread, which he called "pan de lata," on Luco.

The next morning we were up in pitch darkness for a final breakfast of thick hot chocolate before leaving for San Pablo de Yao. Unfortunately my luggage had been loaded on a horse, which balked every kilometer of the way because of the unaccustomed weight. We arrived at San Pablo before 6:00 A. M., but the last comando had already left; they apparently left early in order to make the round trip to Bayamo before sundown. I hoped to catch a ride in a truck, but we were so far out in the country that not a single vehicle arrived all day. The Pinillas kindly put me up, and I caught a comando into Bayamo the next day. Missing a bus in Oriente can mean a pretty long wait.

In Bayamo, I found that Jervis had been keeping busy. He had met one of the most botanically interesting people in Cuba, John Nystrom, the man who was Ekman's guide over much of Oriente province. That evening we went over and had supper with the Nystrom family, enjoying at once the well-stocked table and the incongruity of these pink-cheeked Swedes talking perfect English to us, while we sat in a tiled Spanish patio with tropical plants banked along the wall behind our backs. Nystrom showed us a number of interesting plants growing in his back yard and told us stories of the trips he and Ekman made up the Sierra Cristál and Pico Turquino. He showed us the article Norman Taylor had published (Torreya 16: 211-225. 1916) asserting that Ekman had not been the first to climb Pico Turquino, but that F. W. Ramsden had done it many years previously. He disagreed violently and insisted that Ekman, in 1915, had indeed been the first; contemporary Cuban writers also give the laurel to Ekman.

Taylor's article gives a summary of botanical exploration in the Sierra Maestra up to the year 1915. There have been but few subsequent explorations in this part of the Sierra Maestra, with the exception of Pico Turquino. Ekman collected near the Bayamesa on the Río Oro in 1916, but apparently did not ascend to the top. Dr. C. V. Morton, of the Smithsonian Institution, visited this region in the fall of 1941 and ascended to the crest of the Sierra Maestra midway between La Bayamesa and Pico Turquino; his collections, still undistributed, are at the Smithsonian Institution.

The visit with the Nystroms was our last night in Bayamo; the next day we had to leave for Havana and the United States, as our money was nearly exhausted. The Bayamesa was left unconquered, and the botanical expedition to its summit remains to be made. I have mentioned earlier that the Humboldt Group had explored the Bayamesa. Two ascents have been made: the first, under very trying conditions, in 1942, when only two men were able to make it to the top, and the second in 1948, when the weather was much more favorable. From the peak at an altitude of just under 1700 meters the climbers were able to look west and see between La Bayamesa and Pico Turquino the densely wooded valley of the Río Peladero, the last great stretch of untouched, uninhabited forested land in Cuba. While writing this paper,

I have had before me the report on the excursion of 1948, written by Mr. C. D. Bingham. His comment on the view from the peak over the valley of the Peladero (very freely translated below) can serve both as summary and conclusion better than anything I could say:

"When one contemplates in all its wild splendor this beautiful valley, untouched by man, scarcely visited except by occasional hunters of wild pigs, the home of ruiseñores (song-birds) and an infinity of tropical birds, tree-ferns, wild orchids and begonias, and majestic pine forests, and at the same time recalls that the foothills to the north of the Maestrica and the headwaters of the Río Yao which scarcely ten years ago were in the same condition are now only a desolation of waste hillsides and despoiled stony land where only the worthless sao will grow; that at the rate of the prevailing destruction the valley we are looking at today with such pleasure will within ten more years be reduced to the same condition, it produces a profound sadness. For our forest laws are not applied here with all the rigor which the conservation of our few remaining forest riches demands."

## PROFESSOR BARTLETT TAKES TO THE WOODS

The senior editor of the Asa Gray Bulletin, accompanied by John and Louise Grayson, left Ann Arbor on June 23 for an extended field-trip in search of birches and other things. The party plans to travel into the west-central States and will be in the field several weeks. The following brief report from Professor Bartlett, dated June 26, is from Duluth, Minnesota:

"Back at Duluth. Shall work here this p.m. & then leave for all points West if possible. Cold rain & mist & very chilly most of the time so far, but have collected birches & my Oenothera insignis along Lake Superior shore but not exactly at Duluth (type loc.) for things have changed here since 1912".

THE MOBILE SUMMER SCHOOL OF PLANT TAXONOMY AND ECOLOGY. — On June 25 Dr. Elzada U. Clover, with a class of six students from the University of Michigan, set out from Ann Arbor on what is intended to be an 8-weeks' field-course in plant taxonomy and ecology, with particular emphasis upon the floras of the deciduous forest, the grassland, and the desert. Dr. Clover's party will visit the Ozark Mountains in Arkansas, the extensive prairies of the Osage Hills in northeastern Oklahoma, and finally the high grasslands, mountains and deserts of western Texas. Your editors hope to have for you some reports on the expedition as it progresses.

# ADVICE OF A MOUNTER OF HERBARIUM SPECIMENS TO BOTANICAL COLLECTORS

ALTHOUGH I am not a botanist, I do handle and mount a great many specimens. Some of the collections are beautifully prepared, and it is really fascinating work to mount them.

Naturally, as a mounter, I am interested in displaying the individual plants on the mounting sheets so that they will appear at their very best. This could be done much more easily if collectors would remove the mud and dirt from the roots of the plants before they are dried. Another hint, from mounter to collector, would be to bend specimens, too long for the mounting sheet, before they are dried, so as to fit the sheet and leave room for packet and label. It should be remembered that the mounting sheet is only 11 1-2" x 16 1-2" in size and specimens should be at least one inch shorter than the paper if they are to be mounted properly. Wads of grass bent and twisted carelessly or any plants with leaves that are all crumpled and not flattened out properly are difficult to mount. It is bad enough that they are unsightly, but even worse that they do not display their botanical features well enough to permit of easy identification and comparison. Further, in the case of aquatics it would be well to remove as much of the sand as possible. Ferns should be tightly pressed so that every leaf is flat when mounted. All plants can be displayed satisfactorily by the mounter if they are properly cleaned and pressed.

In order to facilitate the study of veining and pubescence, and to permit measurements, the collector should be certain that some of the leaves face upward and some face downward, and that some typical ones show completely. Otherwise the mounter is likely to have to break the dried specimen. It is particularly careless of collectors not to arrange the fronds of ferns so as to show the best developed fertile ones without the mounter having to wreck the specimens after they are dry.

A collector too rarely considers the mounter and perhaps does not realize the difficulties involved in the final preparation of plants for the herbarium. It would be a good idea if he would take a lesson or two in mounting before he goes out to collect. I urge him to do so as it would improve his technique greatly. He would soon develop the ability to estimate a length of fifteen and a half inches.

Some botanists think that a specimen collected as a voucher for a locality record need not be ample and carefully prepared. They run the risk that their collections may be disregarded as not worth the space they would occupy in the herbarium, or the time of a mounter to prepare them. -- Mrs. Elsie A. Lammert, University of Michigan Herbarium.

# COLLECTING BETULA IN THE GREAT LAKES REGION

Charles D. Richards and H. H. Bartlett

IN the late Summer and Fall of 1951 the writers made a trip through parts of Michigan, Ontario, Wisconsin, and Indiana for the special purpose of studying and collecting birches, and for the more general purpose of making observations on plant distribution in the Upper Peninsula of Michigan and in a very small part of the Algoma district of Ontario not far from the St. Mary's River and the Lake Superior shore. It was hoped that the general distributional observations would supplement the junior author's field work of 1947 to 1950 on the geographical distribution of the plants of the Keweenaw Peninsula, some of which are well known to show remarkable localization and areal disjunction.

The special collection of Betula was intended to crystallize some of the senior author's observations and ideas regarding specific and varietal intergradation in birch populations, a matter which had interested him for a good many years. This article is merely an account of our field trip, without systematic conclusions, which will have to await much more study, for the systematic study of Betula is by no means so simple that off-hand pronouncements would be of any great value. So those who are not sufficiently dyed-in-the-wool botanizers to read a somewhat pointless narrative should proceed no farther!

Although all of the birches, trees as well as shrubs, were to be collected, we had planned to make the most ample collections of the shrub forms, and, if we should find any, of their hybrids with the trees. The user of Gray's Manual will have noticed that Michigan is credited with several birches of dubious status, needing careful study, these being:

(1) Betula Sandbergi Britt., supposedly a hybrid of Betula lutea and B. pumila var. glandulifera. (Type locality, in Hennepin County, Minnesota.)

(2) Betula Purpusii Schneid., generally considered to be a hybrid of the same parentage as the preceding. (Type locality, Clark's Lake, Michigan.)

(3) Betula pumila var. glabra Regel. (Type locality unknown, but North American.)

In addition it had appeared from herbarium material and field observations that certain other better known types were distinguishable at some localities but at others were constituents of variable populations that might represent a plexus of segregates from hybrids together with back-crosses to ancestral types.

The situation is not to be understood without special study in the field and much more adequate herbarium material than we have. As a center of field investigation, Ann Arbor seemed rather well located, being somewhat to the north of the southern limit of range of the shrub or dwarf birches as a group. There are only four counties of Ohio in which the group is known, but it is spottily or locally abundant across much of southern Michigan, being possibly absent, however, in some of the counties along the Ohio boundary. On the contrary, the northern tree birches, Betula lutea and B. papyrifera (with varieties) are mostly well to the northward of Ann Arbor, and Betula nigra, which barely enters the state, is of southern distribution.

The first field trips were devoted to finding the type locality of Betula Purpusii and making ample collections there and at a number of other southeastern Michigan localities within Jackson, Washtenaw, Livingston and Oakland counties. The procedure was to sample several localities in each county thoroughly, collecting numbered specimens from individual fertile plants representing the full range of variation. Sterile plants, especially sprouts, were passed over, unless accompanied by fertile material from the same plant. The actual number of fertile individuals that made up a population sample depended upon how many were available and upon whether there appeared to be any obvious variation, but the intention was to do enough random collecting so that characteristics observable only by detailed study in the laboratory would not escape detection. When the field work was begun the fertile catkins were well formed but not yet bearing ripe seeds.

After having sampled populations in the counties of the Ann Arbor area, we set out for our more extended trip in a Chevrolet "suburban" truck, taking an electric drier, plenty of paper, press ventilators, and presses. We stayed at "motels", tourist cabins, or wherever we could plug in the electric drier for overnight drying of our specimens. If some of our collecting localities had no collectible (i.e., fertile) birches, we filled the presses with other material, wasting no opportunity to get whatever else came to hand if there were no birches. The trip took us northward through the Lower Peninsula of Michigan, through several counties of the Upper Peninsula, over into the Algoma district of Ontario, through the whole length of Wisconsin, and then back to Ann Arbor across northern Indiana and southern Michigan. In Indiana, shrub birches occur in eight of the northern counties, but we were not lucky enough to find them. So we made a return trip, likewise unsuccessful, so far as the shrub group was concerned, but shall try again in 1952. Illinois, Ohio, and Iowa also remain to be sampled, in our general region.

## DAY-BY-DAY NOTES

### Saginaw County, Michigan, 5 Sept. (Nos. 1-27)

Since we did not wish to stop for material accessible by one day

excursions from Ann Arbor, we stuck to our determination not to collect until we reached the place auspiciously named Birch Run, in Saginaw County. Here the birches belonged to the alliance of Betula papyrifera (including var. cordifolia) and were typically white-barked if old enough to show this characteristic. In one woods, however, there were a few curious little trees apparently old enough to have white bark if they were ever going to, but with brown bark. Only two were found in fruit, one of them only 9 ft. tall, but of tree form, and one 20 ft. tall, but growing in a clump. We were greatly pleased to find such a variety at the first stop. A name to call it by must await further study.

Gratiot County, Michigan, 5 & 6 September (Nos. 28-82)

Our next objective was to find good populations of dwarf birch at a few localities intermediate between the vicinity of Ann Arbor and the Douglas Lake area, which had been painstakingly combed for us by Professor Pierre Dansereau and Dr. Carroll E. Wood. We found an ideal station at Half-Moon Lake, in the extreme northwestern corner of Gratiot County. Here, on a floating mat, we made a richly duplicated collection from so many individual shrubs that the lettering of them almost exhausted the alphabet. (In the field our temporary designations for the individual plant collections were locality names with consecutive letters. When the first alphabet was used up we went on with AA, BB, et seq. and then, if necessary, with AAA, BBB, et seq. This enabled us to save time in the field by leaving the assignment of permanent collection numbers until the notebook was written up.)

Clare County, Michigan, 6 Sept. (Nos. 84-117)

Our next stops were in Clare County. A locality which well illustrated what an old grammarian called "the innate perversity of inanimate things" was Budd Lake. Here the bouldery lake shore was lined with white birches, but search as we would, only one little tree could be found in fruit. It was laden with catkins and all of its neighbors were sterile. Although this one collection was not representative for the station, we thankfully made specimens from the one fertile tree and neglected all the rest. In general throughout our trip we found the most erratic occurrence of fruiting individuals of the tree species, but the shrubs were generally to be found in fruit, although not uniformly. Since it had been determined to base the study on fertile material only, we refused with few exceptions throughout the trip to take sterile specimens, but the question may fairly be asked if the procedure was altogether defensible.

Roscommon County, Michigan, 7 Sept. (nos. 118-156:221-239)

The next day was an excessively busy one, for we were approaching but not yet within the area usually reached by the botanists of the

University of Michigan Biological Station at Douglas Lake. The first stop in Roscommon County was at Dead Stream Swamp, west of North Bay, Houghton Lake. The station appeared ideal for shrub birches, but proved to be otherwise, for we found only one specimen in a diligent search. This was most unusual, for experience led us to expect to find a large colony or population in each station where the group of Betula pumila occurred, although the colonies might be few and far between.

The next locality made up for the deficiency of the first. Only half a mile west of Roscommon, where a stream flows through a tamarack swamp, we found an immense population, where the selected and lettered representative plants nearly exhausted the third alphabet. In general we anticipated that the most likely habitat for Betula pumila was a tamarack swamp.

Crawford County, Michigan, 7 Sept. (nos. 157-220)

Within a mile of Frederick, to the south, in a swamp along highway U. S. 27, we made our only stop in Crawford County. Here the entire collection consisted of Betula, and the individual selections almost used up the second alphabet.

Emmet County, Michigan, 8 Sept. (nos. 240-247)

After the tremendous activity of yesterday we did almost no collecting but needed the day at the Biological Station for drying specimens. It was interesting, however, for botanists allergic to ragweed pollen, as we both were, to observe that although we had run beyond the region of greatest abundance of the ubiquitous common species, Ambrosia artemisiifolia, we had come into the newly extending range of another, namely, A. psilostachya. This is in the local herbarium of the Biological Station from several localities. We found a depauperate form of it in the wet border of the Maple River Swamp (no. 240). This is a prairie species that seems to be taking advantage of the clearing of forest and making headway in an eastern invasion fairly well to the north, but not in southern Michigan.

Ordinary ragweed was observed throughout the Lower Peninsula. North of Gratiot County, Michigan, the amount of ordinary ragweed decreased appreciably, with resultant relief from allergic symptoms. Ragweed was scarce in the Algoma district of Ontario and in the eastern part of the Northern Peninsula. Going westward across the Northern Peninsula our first record was for the vicinity of Garden in Delta County. From there southward, at Fayette and toward Burnt Bluff, it was frequent. Between Gladstone and Escanaba we recorded the occurrence of much ragweed on the bluffs and banks. Ambrosia psilostachya (no. 793) was collected in the vicinity of Norway in Dickinson County, where it occurred with the common species. From

there southward, into and through Wisconsin, A. artemisiifolia was frequently seen but was not abundant in the northern part of that state. It became common in Marathon County.

Chippewa County, Michigan, 9 & 10 Sept. (nos. 248-336)

Since a prime objective of the trip was to study variation of the dwarf birch population in a region where we expected to find both Betula glandulosa and varieties of B. pumila, we made haste to reach Chippewa County, and crossed Mackinac County without a stop, leaving it until later. Our first collecting was a mile north of the place midway up the coast of Whitefish Bay, shown as Taquamenon on some maps, but Paradise on others, and called Paradise by the inhabitants. Three miles south of the sand road leading northwestward to Vermilion there was a fine swamp of dwarf birch where a fair sampling of the population was made. We soon turned off across the sandy jack-pine plain to Vermilion and saw no more dwarf birches until we reached the long line of ponds and bogs lying between the high, well drained sandy plain and the dunes along Lake Superior at the abandoned Coast Guard station of Vermilion. In these bogs there is an abundance of dwarf birch, but no Betula glandulosa could be found. Yet there is a specimen in the Michigan Herbarium from this place (C. K. Dodge, 19 June 1914.) Types that would fall under B. pumila were sampled, and other botanical souvenirs of the trip were put in press. Then we reluctantly turned back.

The next day we stopped at a shrub willow swamp along a little stream at Kinross, where a small colony of dwarf birch showed little variation and there were only two fertile plants. This was one of the exceptional habitats for shrub birch without tamarack.

Mackinac County, Michigan, 10 & 11 Sept. (nos. 337-419)

After a hurried trip back across the straits to the Biological Station, for packing and shipping specimens, we set out again for the Upper Peninsula, intending to examine some of the limestone bluffs and hills north of St. Ignace. The flora was of a somewhat more diversified nature than on the sandy soils but nothing very startling turned up. The geologists have probably explained to their satisfaction why the plateau at the top of these declivities appears (on superficial examination, to be sure) to have no mantle of glacial drift, and have decided that "Castle Rock", a tall, chimney-like isolated limestone pinnacle which stands apart from the bluff is post-glacial. Wave action doubtless accounts for the pinnacle, but there are places such as this where immediately local evidence of glaciation has been obscured by post-glacial events.

Five miles north of St. Ignace we turned a short distance eastward to visit "Rabbit's Back Peak", more of apparently the same limestone

formation as the bluffs where we had just stopped and with much the same flora.

Our last stop, still in St. Ignace Township, was near Platz Lake, where, in a bog not far from the intersection of highways U. S. 2 and M. 134 (the road to Cedarville) we made an excellent collection of dwarf birch, here not so dwarf, for much of it was from 8 to 9 feet tall.

We were now content, having filled a little geographic gap in the Betula collections, to hurry on to Sault Ste. Marie and to cross over into Ontario. Arriving on the Ontario side of the river we encountered polite but flat refusal of the customs officers to allow us to take any collecting supplies into Canada without payment of full duty. It was of no avail to argue that we would be back with everything we had in a few days. So, being as stubborn as they, we left our electric drier, supplies of paper, presses, etc., in bond at the customs warehouse, having made up our minds to make a foray of a couple of days anyhow, and to collect only what would not deteriorate in that length of time. Turning southward after dark we drove to Echo Bay, as far as we felt we could go if we stopped to botanize on the way back northward the next forenoon.

Algoma County, Ontario, 12 & 13 Sept. (nos. 420-590)

In the morning we had our first view of the beautiful and interesting white quartzite hills to the eastward. Running north and south for many miles, they seemed a real mountain range to Michigan eyes. We had to take time for a glance at one of the bare-topped white knobs, so drove 4 1/2 miles to the eastward and climbed one that was not too far from the Lonely Lake road. The flora was meager, but the habitat enchanting. It was too late in the season to make a really representative collection. Search of the swamp along a small stream for dwarf birch was fruitless. It was not there.

Turning northward we hurried along to the very end of the road which, north of Sault Ste. Marie, follows somewhat near the shore of Lake Superior. In general we stopped to search the wet places and swamps for dwarf birch, but found none. At each stop, however, we hastily put a few botanical souvenirs in papers. The longest stop and best botanizing was at Mamainse Point, Lake Superior, in the location of the Quebec and Lake Superior Mining Association, 11.5 miles south of Alona Bay. Here we found Rubus parviflorus, one of the species which, from the standpoint of Fernald's nunatak hypothesis, would be considered as falling into the "phytogeographically critical" group. It was in fruit and fairly common along the borders of spruce-balsam woods, but by no means as abundant and aggressive as in the Keweenaw Peninsula of Michigan. At this locality we made a fair sampling of the tree birches, breaking down somewhat in our determination not to collect any sterile specimens. It was a good locality for Betula but

we could not take many duplicates with any prospect of getting our material dry.

The Lake Superior Road ended abruptly just beyond the mouth of the Montreal River, where we found good tourist accommodations, at Twilight Cabins, and had only a few moments to scuttle about botanizing before a storm broke. The night was a wild and noisy one with wind blowing like fury and rain in sheets, but we enjoyed our snug, comfortable cabin and worked until midnight to get our mountain of hastily gathered specimens laid into papers and tied in packages. The rain let up about ten in the morning, and on the gravel bluff along the shore we found beautifully fruiting Crataegus Douglasii (no. 539) the second of the "phytogeographically critical" species that we turned up in the Algoma district. This dark-purple-fruited and distinctive species was one of the prizes of the trip. Hating to turn back after so cursory a snatching at the flora, but knowing that if we stayed longer our collections would spoil, we started southward.

We made the longest stop for exploring and collecting in the vicinity of Camray Mines, which is about 6.6 miles southwest of the mouth of the Montreal River along the Lake Superior shore. A special search was made for fruiting trees of white and yellow birch, but although these species were plentiful in the forest it was with much searching that we finally located fertile ones. While searching for the birch we happened upon a spot where Adlumia fungosa was growing in great profusion over a thicket of shrubs and saplings. It was beautifully in flower and we took a number of specimens. We had not seen it previously on our trip and were quite surprised to find it here. So far as we know it has not been reported from the Algoma District. At least it is not reported by Hosey in his flora of the Batchawana Bay District.

Going northward the day before it seemed to us that we had passed the northern limit of Quercus rubra var. borealis and Tsuga canadensis. These species appeared to be completely absent at the northern end of the Lake Superior Road. So on the way back we made a point of keeping a careful watch for them. They were first encountered, both at almost the same time, about 12 miles west of Batchawana Bay on a forested slope south of the Batchawana River, north of Carp Road. Quercus macrocarpa is reported as occurring in the Algoma district but we did not see it.

All likely localities for dwarf birch were searched, but we did not find it at all on the Canadian side of the St. Mary's River. It has been collected by Hosey in the Batchawana Bay region but must certainly be very scarce.

There were various other species that we noted the first time we saw them on the way southward. These were: Ambrosia artemisiifolia, 7.2 miles north of Root River; Viburnum cassinoides, 1 mile north of Goulais River; Rhus glabra, middle of Havilland Township.

We retrieved our property at the customs office after dark, ferried back to Michigan, and in order not to be tempted to spend time collecting again in territory already traversed, we drove to Newberry before stopping, and there did press work until 2 A.M. The next day, wishing not to fritter away time in general collecting until we found a good shrub birch locality, we were well into Schoolcraft County before we stopped, and had failed to get any Betula in either Luce County or the western end of Mackinac County. Of course, we may have passed numbers of good stations of which there was no indication from the highway. Plant hunting from a car has its limitations!

Schoolcraft County, Michigan, 14 Sept. (nos. 591-684, 716-729)

An interesting habitat was found near the junction of highway U. S. 2 and the road to Old Deerfield, two miles west of Gulliver. Here there were horizontal limestone strata with only thin residual soil overlying, and no glacial drift, so far as a botanical eye detected. Stopping here for a look at the plants we were accosted by a young man who asked if we were botanists. When we admitted that we were, he introduced himself as Warren H. Wagner, newly appointed Instructor in Botany at the University of Michigan, on his way from the University of California to Ann Arbor, by way of the Biological Station. With him was his wife, the former Florence Siniago, who had deserted Ann Arbor for Berkely some years ago to take a Ph. D. in Botany (and a husband), and was now being repatriated! They had been very successful in collecting gametophytes of Botrychium for morphological study, and had a great lot of pickled collections. We were headed in opposite directions, and paused only for introductions and greetings. In a little swamp 1.6 miles from the city limits of Manistique we made the day's only shrub birch collection. The plants were up to nine feet tall near water, and seedlings extended up a slope into a pure sand habitat. Having seen nothing like this before, we assumed that there was an impervious spring level covered by sand. At Manistique we suddenly realized that we had not consciously seen either a Quercus or a Rhus all day. Were these genera missing from Newberry to Manistique? It hardly seemed possible. We had seen ragweed frequently all the way.

Delta County, Michigan, 14 & 15 Sept. (Nos. 685-715; 730-784)

Three miles southwest of Garden we noticed Rhus on an area of flat limestone with only a thin soil covering. A mile before reaching Fayette we also encountered Quercus rubra var. borealis. Here also there were large butternut trees, which surprised us because the locality was far out of the reported range of Juglans cinerea. A bit of scouting showed that the specimens, although now surrounded by second-growth woods, were all along the road, and since they occurred at rather regular intervals it was evident that they had been planted a good many years ago at the border of a clearing which had since

reverted to forest. Still it was not impossible that the original source of the planting had been native, for the species is mapped by Fassett for Ashland County, one of the northern tier of Wisconsin counties, farther north than we were here and in that county there is a place actually named "Butternut."

We arrived at Burnt Bluff very shortly before dark and our too brief collecting there was disappointing. We did not have sufficient time to explore the limestone ledges, but a few plants were picked up in the woods and on the talus at the base of the bluff. These included Celastrus scandens, Dryopteris marginalis, Cystopteris bulbifera, Pyrola secunda, Taxus canadensis, Shepherdia canadensis, Polypodium virginianum, Hepatica acutiloba, and Quercus rubra var. borealis. The locality is notable for unusual mosses which Steere discovered here. The limestone cliff is spectacular, and a place where some rarity among the higher plants might well occur, but the locality had previously been botanized by McVaugh, and we might better have spent our time at less spectacular limestone cliffs and ledges near Fayette. Of course we had hoped to find a good birch population near this outstandingly distinctive locality, but there was no suitable habitat for shrub birch and we had not seen it south of Manistique. The next day, however, we found good populations of it and made excellent collections, although we had failed to find it in the long narrow limestone peninsula projecting southward to the east of Big Bay de Noc, and in line with Washington Island and the long peninsula of Door County, Wisconsin, bounding Green Bay. Westward of the head of Big Bay de Noc, however, still following highway U. S. 2, and still in Delta County, we soon reached more dwarf birch localities. There was an abundant population beginning near Sturgeon River Station on the Minneapolis, St. Paul and Sault Ste. Marie Railway, a mile northeast of the highway bridge over the Sturgeon River, and extending for a couple of miles to the westward. Few of the shrubs, of heights up to 9 feet, were fertile, and most appeared as if diseased. They grew in a tamarack swamp with Spiraea tomentosa. Here there were scattered plants of closed gentian. The remaining dwarf-birch collection in Delta County was made about 4 miles northeast of Bark River. The population was large, but the bushes were only four to five feet tall and practically all of them sterile and not vigorous.

Having put our minds on recording the first occurrence of certain other species, we made a definite note that there appeared to be no oak except Quercus rubra var. borealis in the stretch from 4 1/2 miles west of St. Jacques through Wickham, and on to Gladstone. A mile south of Gladstone near the shore of little Bay de Noc we came upon Iva xanthifolia. Two miles west of Escanaba there was a swamp where Rhamnus alnifolia was a dominant species. Around Escanaba were acres of tall ragweed, lining the shoulders of the roads. The banks and bluffs from Gladstone to Escanaba were covered with luxuriant pubescent sumac thickets.

Menominee County, Michigan, 15 Sept. (nos. 785-790)

A mile east of Hermansville a tamarack and arbor-vitae swamp contained thousands of almost sterile dwarf birches, 4 to 5 feet high.

Dickinson County, Michigan, 15 Sept. (nos. 791-797)

We failed to find dwarf birch. About 2 1/2 miles west of Norway we examined the luxurient growth of ragweed and found it to consist of a mixture of Ambrosia psilostachya and A. artemisiifolia, growing along the road and around the sumac thickets.

Forest County, Wisconsin, 15-16 Sept. (nos. 802-825)

In a tamarack swamp along highway U. S. 101, 4 1/2 miles north of Armstrong Creek, dwarf birch was abundant but sterile. The same was true at a tamarack-Sphagnum bog near Rice Lake, 2.7 miles south of highway junction B (near Sherman School, on highway W. 55) and an equal distance north of the county line.

Langlade County, Wisconsin, 16 Sept. (nos. 826-850)

The only place on our trip where we encountered Hypericum Ascyron was about 2 miles northwest of Lily, and about 4 miles southeast of Pickerel, along highway W. 55. This made us wonder how often we had missed seeing the species that we were looking for, since Hypericum Ascyron is said to be generally distributed in Wisconsin, and is definitely reported from twenty-one counties. At Hollister, 3 to 4 miles northwest of Langlade, we found Hamamelis for the first time on the way southward, and suspected that it may have been near its northern limit here. Finally, near Langlade, 3 miles southwest of the bridge over Wolf River, on highway W. 64, we found the last small population of dwarf birch that we were to see for a long distance. Like the others seen in northeastern Wisconsin, it was mostly nonfertile and in very poor condition, and collected only for locality record. At White Lake, in the southeastern corner of the county, there was Taxus canadensis. To counterbalance finding this pleasing species, there was common ragweed in abundance.

After leaving Langlade County, which is only a third of the way down the length of Wisconsin, we found no more dwarf birch throughout the middle part of the state. It may well have been there, and we may have just missed it, although many localities were searched. Anyway, we found no more until we reached Fond du Lac County, and our observations agree with Fassett's published map, which shows a blank covering much of the center of the state, but shows also that distribution is continuous down through the counties bordering on Lake Michigan. We had had the curious experience of finding the dwarf birch populations of the western counties of the Upper Peninsula of Michigan and adjoining Wisconsin uniformly in very poor condition,

the plants apparently more or less diseased, containing much dead wood, and prevailingly sterile. Then, through the middle third of the length of Wisconsin, we found none along our route, but were to find much, in excellent condition, in the southeastern part of the state.

Marathon County, Wisconsin, 16 Sept. (nos. 851-886)

One of our very choice collecting stations in Wisconsin was Rib Mountain in Marathon County. It is said to be the highest point in Wisconsin, having an elevation of 1940 ft., but we talked with an apparently well-informed visitor who said that a hill near Laona in Forest County was 4 feet higher. The ridge is forested to the summit but there are many areas of quartzite outcrop and bare talus. Both white and yellow birch were collected in excellent fruiting condition along the border of the ski-run. The yellow birch as it grew on the upper crags was naturally not the usual large tree, but a little form fruiting abundantly when 12 feet high. Clematis verticillaris was found in several places on the talus. Small white pines were numerous in the rocky openings around the summit. And, alas, ragweed was fairly common along the paths and roads leading to the summit. From this point southward, in fact, it may be taken for granted that common ragweed was present almost everywhere.

Portage County, Wisconsin, 17 Sept. (nos. 887-946)

Travelling southward it was interesting to see more southern and prairie species appear. Six miles west of Stevens Point a large bog appeared as if it should contain tamarack but there was none, and no dwarf birch either. At the edge there was plenty of white birch, with Quercus Hillii, not seen before today, but no white oaks.

At Whiting there is plenty of Quercus macrocarpa, and still some native Pinus Banksiana. Then for twelve miles birches and evergreens are replaced by oaks and elms.

Near Bluff School, 2 1/2 miles west of highway U. S. 51, and southeast of Bancroft, there is a hill of quartzite and sandstone with thin residual soil and apparently no glacial drift. At the base is a sand plain. Here white oak (Quercus alba) was plentiful and really smooth Rhus glabra. (The sumacs of northern Wisconsin and the western part of the Upper Peninsula of Michigan had been hairy ones that one might perhaps distribute to R. typhina and R. glabra var. borealis.) Here also was good fruiting white birch, at the very top of the hill.

Waushara County, Wisconsin, 17 Sept. (nos. 947-973)

Two and a half miles north of Hancock all three native pines were present apparently as wild trees, but the red pine was also planted. South of Plainfield there were no more clearly unplanted ones, and white birch was becoming scarce. In this direction it seemed to be

almost at its southern limit, but later we passed at least one tree in Marquette County, within a mile of the county line. Two miles south of Coloma was typical sandhill country, with Ceanothus ovatus, Oenothera rhombipetala, etc. To the southwest of Coloma, near Pleasant Lake, was a limestone hill with slopes that might be interesting earlier in the season (we saw a curious sterile Heuchera), but the top was a mere corn field! There was plenty of white oak at Pleasant Lake.

Columbia County, Wisconsin, 18 Sept.

Turning eastward from Portage, Columbia County, on highway W. 33, we did little botanizing except to search for birches, which we did not find if any were there. There were woods or sufficient vestiges of wood lots to indicate that this was a stretch in which several important trees became common. It is a defect of phytogeographic maps that frequently no distinction is made between areas of generally continuous distribution and the fringe areas where there are islets of distribution, or very scattered individuals, and it is equally a defect of the roadside observations of a travelling botanist that a species may have been present through many miles of mostly cleared land before he sees it. For what our observations may be worth, however, they indicate that the first hickory was 6.8 m. east of Portage; then red cedar and burr oak appeared. Before reaching the junction with W.44 (just eleven miles east of Portage) there had been scattered white oaks (Quercus alba) for a couple of miles, and along the whole eleven miles there were apparently three black oaks, which we tentatively called Quercus Hillii, Q. velutina, and Q. coccinea. At any rate, we were no longer making note of Q. rubra var. borealis. We wondered if it was really absent, or if the presence of other oaks to be looked for had blinded us to seeing it! Not seeing a species in a hurried traverse is no proof of its absence. At 13.9 miles we saw our first black walnut. Common enough in the two southern tiers of Wisconsin counties, Juglans nigra has an extension somewhat to the northward along the Mississippi, but, according to Fassett, would be expected in Columbia County only in cultivation. We have no evidence, of course, that it had not been planted where we saw it in Columbia County, but it did not appear to be. At highway "Junction H" a roadside sign read: "Edge of the Prairie". If one should wonder why such a sign would be useful, he may be referred to Aldo Leopold's charming book of nature essays, "A Sand County Almanac".

Leopold wrote (pp. 269 seq.): ". . . history made bur oak the characteristic tree of southern Wisconsin when the prairie fires first gained possession of the region. Bur oak is the only tree that can stand up to a prairie fire and live. . . Bur oaks were the shock troops sent by the invading forest to storm the prairie; fire is what they had to fight. . . there were allies that threw their support first to one side

then to the other. . . But for this geeing and hawing of allies, and hence of the victory, we should not have today that rich mosaic of prairie and forest soils which looks so decorative on a map. Jonathan Carver has left us a vivid word-picture of the prairie border in pre-settlement days. On 10 October 1763, he visited Blue Mounds, a group of high hills (now wooded) near the southeastern corner of Dane County. He says:

'I ascended one of the highest of these and had an extensive view of the country. For many miles nothing was to be seen but lesser mountains, which appeared at a distance like haycocks, they being free from trees. Only a few groves of hickory, and stunted oaks, covered some of the valleys'.

'In the 1840's a new animal, the settler, intervened in the prairie battle. . . he just plowed enough fields to deprive the prairie of its immemorial ally, fire. Seedling oaks forthwith romped over the grasslands in legions, and what had been the prairie region became a region of woodlot farms."

Then Leopold quotes John Muir. "As soon as the oak openings were settled, and the farmers had prevented running grass-fires, the grubs [roots] grew up into trees and formed tall thickets so dense that it was difficult to walk through them, and every trace of the sunny openings vanished."

Dodge County, Wisconsin, 18 Sept. (Nos. 975-978)

Some four miles inside Dodge County there is a sign reading: "Chief Kunos Trail", which "trail" leads all the way around Fox Lake. We saw no birch and no conifer, except Juniperus, that was probably not planted. Here there were burr oaks, black oaks, and basswood, but apparently not even Quercus alba. The flora was essentially similar from Fox Lake to the Horicon Marsh Wildlife Area. This is now, to the botanist at least, a place of breath-taking beauty as one looks across miles of lake and marsh from the administration house. We had planned to make intensive search for dwarf birches here, but were informed by the manager that we would only waste our time, for the staff knew the area intimately and there was nothing of the sort there. An admirable pamphlet* which is distributed to visitors indicates possible historical reasons. In 1845 and 1846 the marsh was dammed, and the water level raised nine feet, creating what was reputed to be the largest artificial lake in the world. (From this lake, in 1856. 140 tons of pickerel were shipped to eastern markets.) Needless to say, much of original vegetation was drowned.

The removal of the dam in 1869 made a shallow broad marsh of

*Truax, W. C., Horicon Marsh Wildlife Area: its Past, its Future. State Conservation Commission of Wisconsin, Pub. 350-50. July 1949. (Cover-title + 10 pp.)

the area, which became famed for production of waterfowl and for hunting. Next, disregarding a ruling of the State Supreme Court, the marsh was gradually drained by a main ditch, with laterals, between 1909 to 1918. A fight to restore the marsh began in 1921; the state purchased part of the area; a dam was constructed and closed in 1935; the federal government took over responsibility for acquiring the remainder of the area in 1940; and finally, in 1949, plans were made for auxilliary impoundments and establishment of a final and regulated water level. All this indicated that regardless of the tremendous ecological interest of the marsh, the sequence of change from marsh to lake, then to marsh, then to agricultural land, and then back to marsh and lake, may have brought about some depletion of the flora.

All this information was discouraging, and led us to change our plans. The Manager at Horicon Marsh suggested that we investigate the Kettle Moraine State Forest area to the northeast of Horicon. This proved to be excellent advice and we turned northward again. We were soon to find dwarf birch in abundance at several localities in both the North and South Kettle Moraine areas and our best Wisconsin collections are from these areas.

Fond du Lac County, Wisconsin, 18 Sept. (Nos. 979-1054)

In the northern unit of the Kettle Moraine State Forest the dwarf birch populations were beautiful and in fine fertile condition. The headquarters house is near Mauthe Lake, and there, on the swampy, bushy and forested shore it was abundant; some shrubs as much as 9 feet tall. This population was easily and quickly sampled, and then we looked for fertile tree birches. Betula papyrifera was abundant, but mostly sterile. Yellow birch was there, but sterile. At the edge of the headquarters clearing there were two white-barked birches, loaded with catkins, that would be placed under Betula populifolia. It seemed that planting these white birches here, where the woods were full of B. papyrifera, would have been somewhat like carrying coals to Newcastle. We could not ask Superintendent Schmidt about them because he was working elsewhere in the forest, but his son, Robert Schmidt, graduate student in Landscape Design at the University of Wisconsin, was at home and ventured the opinion that they had not been planted, but spared in clearing the edge of the woods at headquarters. The matter was so interesting from the standpoint of phytogeography that we tried to get definite information later by correspondence, with no success. Betula populifolia formerly existed as an isolated colony in northern Indiana (see Deam's Flora of Indiana) but may have become extinct there.

From Mauthe Lake we went to Mud Lake in the same area and again found abundance of dwarf birch. Here it grew on the floating mat and the population as a whole consisted of low bushes, of considerably different aspect from those along the wooded margin of Mauthe

Lake. Here the most notable discovery of the trip was made, a single little "tree", fully fertile, that could not be placed except as a hybrid, perhaps X Betula Sandbergii, but careful comparisons must be made. It was only a little thing, but half again taller and more tree-like in form than the tallest of the dwarf birch shrubs by which it was surrounded. It was conspicuous from a distance by the different hue of the foliage. There was Betula papyrifera at the margin of the woods along the lake, so the conditions were quite suitable for the occurrence of a "new" hybrid as distinguished from a rare segregate from a complex population hybridized perhaps thousands of years ago.

After such a long run through central Wisconsin, in which we found no dwarf birches at all, it was a great satisfaction to find ourselves again within the range of them, and also to run across a notable hybrid.

Washington County, Wisconsin, 19 Sept. (Nos. 1055-1070)

In line with the northern and southern units of the Kettle Moraine State Forest, we stopped to search only one locality, north of Cedar Lake near the intersection of highways W. 33 and W. 144. Here there was a floating mat which had been taken over by Typha and patches of shrubby willows, with which the dwarf birches, 6 to 8 ft. tall, grew in an association different from any seen before. Collecting was more difficult than usual, but a good sampling of the population was made.

Waukesha County, 19 Sept. (Nos. 1071-1119)

At Silver Lake in the southern unit of the Kettle Moraine State Forest, there was no difficulty in finding another habitat like the last, — a floating mat mostly of shrub willows and Typha. Again we made a good dwarf birch collection.

Time was growing short before we had to get back to Ann Arbor, so we reluctantly passed through the rest of Wisconsin and the corner of Illinois after dark, intending to spend the next and last day of the trip finding one or more of the reported localities in the northern part of that state to represent the limit of range to the southward of Lake Michigan. We had no success whatever, but investigated place after place until dark and then headed for home, planning to return for further search as soon as possible, and at the same time to sample populations in southwestern Michigan. (Miscellaneous Indiana collections were nos. 1120-1165.)

Jackson County, Michigan, 4 Oct. (Nos. 1166-1241)

The first dwarf birch collection of the supplementary trip was made in a county from which collections had been made formerly, but this habitat, a tamarack swamp 1.3 m. north of Tompkins, was an excellent one. Whatever birch localities there may be in Eaton County were missed.

Barry County, Michigan, 4-5 Oct. (Nos. 1242-1330)

In a roadside swamp along highway M. 79, southwest of Thornapple Lake and a mile east of Quimby, we found a small but healthy vestigial shrub birch population, in which the tallest bushes were 5 1 2 to 6 feet tall. If, as seems probable, this locality had once been a tamarack swamp, the tamarack was extinct.

The Yankee Springs Recreation Area is a delightful region of lakes and sand-hills. The latter had gleaming patches of flame-colored sassafras and a scarlet to deep crimson ground cover of fruiting Rhus Copallina, in what appeared to be two slightly different forms, which did not show the same reaction to frost. A mile southwest of Yankee Springs we made the day's good dwarf birch collection in a tamarack swamp. Then we followed a "nature trail," obviously little used, into the swampy peninsula extending into Gun Lake from the north. The trail follows an ice-push ridge along the shore, through hemlock and beech woods, with Taxus in the undergrowth. We saw no birches.

Then we traversed Allegan County (nos. 1331-1340) and found none. Wishing to call on Mr. and Mrs. Clarence R. Hanes before too late, we hurried on to Schoolcraft, had a fine visit with the hospitable authors of the admirable "Flora of Kalamazoo County," and arranged for bog trotting with Mr. Hanes the next day.

Kalamazoo County, Michigan, 6 Oct. (nos. 1341-1478)

The localities visited with Mr. Hanes are described in the Flora of Kalamazoo County. First we went to his dwarf-birch locality at Hogset Lake. Here the plants were mostly small and scattered, ranging up to about five feet tall. The area was an open and exposed lakeside swamp with ornamental clumps of autumn-tinted poison sumac and cornel bushes. The birches were partly defoliated, but it was still not too late to make a good collection.

Next we visited his locality on the swampy wooded shore and in the swampy woods along Little Sugarloaf Lake, where we saw yellow birch, dwarf birch, and what appeared to be a series of intermediates as much as 15 feet tall. This extremely interesting locality yielded an excellent collection, although not all of the plants were fertile. On the way back we went over the hill between Big and Little Sugarloaf Lakes, through a beautiful beech woods with an unbelievable quantity of Epifagus, partly of gigantic size, the heavy clumps 18 inches tall.

At midday we returned for a sumptuous turkey dinner, "with all the fixings," for Mrs. Hanes had given up the botanizing to prepare a forerunner of a regular Thanksgiving dinner! Afterwards we wallowed through the third of Mr. Hanes" notable localities, a densely bushy and wooded springhead where a cold stream arose in a depression among the sand-hills. This was the locality recorded in the "Flora" as

"Texas Township, Section 24," and surely it was so obscure and hidden away that no mere visitor, whizzing along a main highway, would ever have found it. The habitat and associated plants were quite unlike the usual ones. Here there were scattered dwarf birches and a taller form that appeared to be a hybrid. The exact plant that Mr. Hanes wished to find eluded our search, but he found a duplicate of the original collection later, and sent it for the Herbarium. We left the cordial Haneses in late afternoon, after a delightful day, never to be forgotten.

St. Joseph County, Michigan, 6 Oct. (nos. 1479-1488)

Although the exceptional localities to which Mr. Hanes had guided us had led to some questioning of how adequate our rapid-collecting tour really was, if we investigated mostly the localities that looked right, we stopped before dark at a tamarack swamp 8 miles southwest of Three Rivers. We made a nice collection of dwarf birch and were very glad we did, for it was to be our southernmost one. Again we were to be disappointed by not finding it in Indiana!

La Porte County, Indiana, 7 Oct. (nos. 1498-1504; 1509-1514)

It rained continuously all day. At Pine Lake, northwest of La Porte one of us had spent a happy summer in 1893, had fished from the dock for his first pumpkin seeds and caught his first turtles along the marshy shore. There was then a waterway to Michigan City, and a little excursion steamer that made the trip. Now no one would believe it, for things had changed greatly. The old cottage, then called "Bark Cottage" because it was sheathed with great slabs of bark from giant white oaks, was still there, but now veneered with cement blocks! The lobe of the lake on the far side of a peninsula that nearly cuts the lake in two is called "Little Pine Lake." Here there were four clumps of a birch with bright orange-salmon peeling bark. The one we could reach was sterile. The others were too deep in the lake (the water level was unusually high) to be reached without a boat, and none could be found. There seems to be no name available for this curious birch except Betula nigra, but it must be investigated more thoroughly some other time. The only other birch that we found in La Porte County was Betula papyrifera, collected just southwest of the state line in woods along highway U. S. 12.

Porter County, Indiana, 7 Oct. (nos. 1489-1497; 1505-1508)

We searched as thoroughly as we could for Deam's locality for X Betula Purpusii, but could not find it, nor any form of dwarf birch. It was interesting however, to get even Betula papyrifera near its southern limit of range in the Lake Michigan region, so we made a good collection from the swamp and dune area north of highway U. S. 12, 5 miles east of the junction with I. 49 and 2 miles east of the road to Furnassville. Since white birch plantings for ornamental

purposes are becoming common, and the scattered trees of undoubtedly native Betula papyrifera are getting scarce in this area, the exact locality is worth recording.

Our main birch collecting trip, and its supplement, not taking account of single-day trips earlier in the season, probably resulted in fairly good coverage for the Lower Peninsula of Michigan, the southern part of the Upper Peninsula, and eastern Wisconsin. No matter what special collecting trips may bring together in the study of a particular genus, it must inevitably be true that local botanists, intimately acquainted with their localities, as Mr. and Mrs. Hanes are with Kalamazoo County, are likely to make the most interesting finds. We failed to find a single locality for dwarf birch in Indiana or Ontario, but are convinced that critical study of the immense amount of material that we brought together will answer questions about several dubious forms in our Great Lakes region.

A FLORA OF MANITOBA IN PROSPECT — Dr. H. J. Scoggin, author of the excellent "Flora of Bic and the Gaspé Peninsula, Quebec," has been engaged since 1947 in studies and collecting which, it is hoped, may lead to the preparation of a "Flora of Manitoba." In 1950 and 1951 he published three substantial studies on botanical surveys in Manitoba, and has another in press. His Manitoba card index, on approximately 6000 4 x 6 inch cards, cites all the herbarium specimens that he has been able to locate, all references in the literature (citations and critical studies) and detailed northern limits as indicated in works on Alaska, northern Canada, Greenland, Iceland, etc., for the northern component of the flora. His own collections amount to about 7500 numbers, many of which indicate significant range extensions. He is very enthusiastic indeed over his Manitoba investigations, for the whole area is one large blank on most maps of plant distribution.

The sort of work that Dr. Scoggin is doing is being sadly neglected by all scientific agencies in Canada except the National Museum, with which Dr. Scoggin is connected. There, most excellent publications are appearing, of which the last is A. E. Porsild's "Botany of Southeastern Yukon adjacent to the Canol Road" (Nat. Mus. Canada, Bull. 121. Ottawa, 1951).

No other agency in Canada except the National Museum would be likely to sponsor such an investigation as that which Porsild has completed and published, or as that of Scoggin on Gaspé, or the new one on Manitoba that he has in preparation. It is greatly to be hoped that momentum will not be lost by narrowing the activities of the Museum to exhibition and general education. That would probably result in great loss of work now under way, which it is highly unlikely that any other Canadian institution would provide for. — H. H. Bartlett

# MID-OCEAN CHRONICLE

Albert J. Bernatowicz

MORE than twenty-five years ago Dr. Wm. Randolph Taylor started his studies of the marine algae of the warm Atlantic with a survey of the algal flora of the Dry Tortugas. His catalogue for this region, published in 1928, became the backbone of a more ambitious attempt, — a marine flora of the Caribbean. Reinforced by his own collections from Panama, Caledonia, Curaçao, and Trinidad, and the collections he has identified for others from as far south as Brazil, Dr. Taylor's manuscript grew so promisingly that professional help with the illustration seemed justified, especially since most of the species of the area had never been adequately figured. Several artists were set to work on the project and many striking plates were produced. The pressure of other work could not be ignored, however, and a succession of field studies in areas unrelated to the Caribbean, — British Columbia, Newfoundland, Galapagos, Bikini, New England, deferred completion of the Caribbean flora. Moreover, there are so many Caribbean islands, each potentially harboring endemic species, and each potentially significant in analyses of variation and distribution, that further field work in the Atlantic was highly desirable.

When a postwar sabbatical leave was offered in 1949, the time for the requisite field work became available. Through a fortunate coincidence, the director of the Bermuda Biological Station, Dr. D. E. S. Brown, evinced desire to have the marine vegetation of Bermuda inventoried for the information and use of investigators at the station. It is easy to see that Dr. Brown's desires fitted beautifully with those of Dr. Taylor, for Bermuda represents the northernmost limit to which the Caribbean flora extends. It remained only to finance the operation, and this was accomplished by an allocation from the Bermuda Biological Station toward the expenses of an assistant and laboratory fees, together with further support from the American Philosophical Society.

Through another fortunate (for me) coincidence, I was Dr. Taylor's only graduate student of marine Algae available at that time to accompany him as the assistant.

We started our survey of the shore flora of the Bermudas in February, 1949. A previous survey had been carried out by Collins and Hervey from 1911 to 1917 but these authors had operated mainly in the vicinity of Agars Island, which is rather toward the western end of the island group. The present location of the Biological Station is on St. Georges Island, near the east end of Bermuda, and it was our initial aim to explore this region for the detailed information which uncertainties of Bermuda transport had kept Collins and Hervey from

providing. Accordingly, one of the first duties of the assistant was to learn to row a boat. Now, this is a simple skill and one that would hardly be expected to threaten the success of a scientific expedition, but one must at all times be aware of the shortcomings of an urban education. Row boats do not come equipped with starter buttons or steering wheels, nor are there any curbs or white lines on the ocean to help in maintaining a straight course. Consequently, it was not long before Dr. Taylor found that, if he planned to get home for dinner, it was better to do his own rowing. I had no objections to dangling over the side with a glass-bottomed box to make the necessary observations of the vegetation. Apparently a certain amount of diplomatic maneuvering came into play later on, inasmuch as some very interesting morphological studies demanded Dr. Taylor's presence in the laboratory for several weeks, during which time I became reasonably predictable in driving and parking the skiff.

Some of the locales were sufficiently distant to justify the use of one of the Station's launches, which were always operated by a local boatman, and these trips were the envy of the other investigators. Those who are familiar with Bermuda as portrayed by travel brochures or returned tourists must perforce think of it as a land of narrow streets and limestone houses (whose roofs, according to one embittered landlord, were in danger of collapsing if the termites in the rafters ever stopped holding hands), of bicycles and horse-drawn carriages, and of coral beaches and tropic gardens, but these are the least of the attractions. For Bermuda is especially a land of shores and waters, a fascinating combination of foaming reefs and sleepy coves, where a pale green ocean alternates with murky mangrove swamps, and meadows of sea-grasses, caves, coral gardens, "holes" and shoals forfend monotony. This is the Bermuda one learns from a launch, all in the guise of work, and the obvious reason for the envy of our less fortunate colleagues of the test-tube brigade.

Skiff and launch were not the only means of getting about. Some stations were too far off for rowing and were inaccessible by launch. Then the overland route was indicated, which, in Bermuda, means a bicycle ride. Once, there was a tiny railroad, a passable imitation of the Toonerville Trolley, on which one could travel with his bicycle to within a short distance of almost any point on the larger islands. The rise of modern civilization put an end to this line, and it was replaced by a somewhat less than passable imitation of buses whose seats were so closely set that one could hardly get his knees aboard, much less a bicycle. For the dignified, taxicabs were introduced. Their horsepower was somewhere in the vicinity of sixteen, and the speed limit was held down to twenty miles per hour, but the fares were held to much more than a biologist could afford to pay. I took to cycling as I took to rowing. Happily, the law in Bermuda is strongly prejudiced in favor of the bicycle in its feud with taxicabs. Apparently, even

self-defense is not accepted from taxicabs as an excuse, if we can judge from the incident in which a taxicab left the road (a wonderful hilly road with a field on each side, near the Mid-Ocean Golf Club) to avoid colliding with me, even though I was clearly the aggressor. Since I have never heard from the Bermuda Electric Company concerning the scarred power-line pole on Ferry Road, I do not know the law in such cases. But incidents of this sort were a small matter when there was good collecting down the road a piece and one had to get back to the lab before the jars of specimens were cooked in the winter sun. Dr. Taylor, I should add, was too dignified to use a bicycle and too much a biologist to afford taxicabs, so I made the overland trips alone. So much for our means of getting around.

A few remarks illustrating the arduousness of field conditions in foreign lands such as Bermuda may be in order. The Biological Station is presently located at Shore Hills in a building which was erected for use as a small resort hotel. Very posh, as they say. As a result, the only accommodations available were individual rooms, each with a bath and a screened sun porch. Downstairs, the great entrance hall had been retained for use as a community living room or lounge. The only source of heat when the temperature fell below 70° was the huge fireplace in which we burned cedar boughs. The other halls downstairs had been too large to be used as they were, so they were partitioned off into laboratories. Ours had a fireplace at each end and windows along three of its four sides, but some of the other laboratories had only a single fireplace and one set of windows. Around the building ran a porch furnished with high concrete tables plumbed for salt water. These were the tables at which we mounted specimens or kept the living material in good condition for later study.

For the first few weeks I lived in this hotel alone, with only a chambermaid and one general factotum to look after my needs. The cooks had not yet been "taken on" for the season, so I was left to make shift as best I could in the hotel's kitchen. To a cook who graduated from army C-rations prepared over a sterno stove to canned soup and soluble coffee prepared over a bunsen burner, there is considerable impressiveness about deep-freezers, electric ranges, and whole roasts. After a bit of practice I was able to devise menus which might be called field expedients. Breakfast regularly consisted of soluble coffee and a dry cereal made up with dehydrated milk (whole milk is very difficult to obtain in Bermuda unless there are children in the family). The cereal was of a peculiarly British type called Wheatabix. Unlike the Americans with their snap-crackle-pop cereals, the British seem to prefer soggy breakfasts. Wheatabix may be described as having the texture of a hot cereal which has grown cold. The difference in tastes is vaguely reminiscent of the British penchant for warm beer. Lunch was usually a simple matter of three or four sandwiches taken along on the day's trip. Dinner was rather more ambitious, although

it was generally something which required a minimum of time. One dinner recipe which served me for more than a week may merit repeating here for the benefit of others who may need a simple but nourishing dish to sustain them in the field. It started with a recommendation that I buy an upper joint of lamb which could be butchered to furnish some butts for frying and some odds and ends for the exercise of my ingenuity. Due to some misunderstanding, the joint was not cut up by the butcher, and my own memories of a comparative anatomy course in the dim past were so vague that I was left with nothing but odds and ends when I attempted to cut it up myself. Happily inspired, I put some of the choicer pieces in a pot together with one or two diced carrots and several quartered potatoes. This mixture was left to simmer slowly while I went outside to help mount the day's collection. About two hours later the smell of lamb stew overflowed the lounge and emerged onto the porch where Dr. Taylor and I were working. In the face of such a reminder he went home to the cottage where Mrs. Taylor had his dinner ready and I returned to my kitchen. The potage was indeed done, although the potatoes were not quite so well done as the carrots. Later on I learned that the wild parsley which grew about the grounds was much stronger than any cultivated variety, and a handful or two was a great addition to the stew. For variety, I can strongly recommend a dash of salt and pepper. Sometime in March another investigator was lodged at the laboratory and two cooks were added to the personnel to take care of us.

Terrestrial botanists may be interested in the modus operandi of marine botanists, for there are many differences between the methods of the two. First of all, our plans for the day depended in major part on the time of the tides. Collection and observation are easiest when the tide is lowest, since much of the vegetation is either exposed or within easy reach under water at this time, whereas at high tide most of the rich growth can only be collected by diving. If low tide was predicted for any hour between 9:00 a.m. and 4:00 p.m., we planned to collect plants in situ. If low tide was expected either earlier or later than these hours, we planned to collect at high tide from the drifting vegetation which is left ashore by the receding tide, or we stayed at the laboratory to work on notes and to write labels. On a typical day we left the laboratory directly after breakfast and headed for a shore which would be alee of the day's wind. If low tide were due early, we used the skiff and chose a near-by cove which could be reached before the tide turned. When the tide was late in the day, the launch would take us to places which were two or three hours distant. At the destination, collecting was sometimes done from the skiff, but more often we rowed ashore and climbed out to wade or swim for the specimens. For bulk collections wading was the more efficient means, a glass-bottomed box being used to scan the bottom and buckets and jars served as receptacles. When, however, the detailed survey of a shore in this manner had been finished, it was much more interesting to put

on a face-mask or diver's goggles and to swim around the coral heads in deeper water, or to explore the foot of a cliff or the inside of a cave. Common things could not be collected efficiently in this way because there was no convenient means of retaining much material while one was swimming, but rare species were always saved, even though they often necessitated swimming back to the boat to deposit them in a bucket. At Nonsuch Island there was a magnificent stand of Sporochnus bolleanus, previously considered to be a plant of deep waters, growing in only six feet of water but so hidden by the shade of a cliff that only the use of a face-mask detected it, and at Red HoleBay Asparagopsis taxiformis grew in shallow water which was too deep for wading and too turbulent for the use of a boat but ideal for swimming. It was a species undiscovered by Collins and Hervey in their six or seven years of Bermuda collecting and otherwise known to us only from drifting specimens.

When the rising tide made further collecting unprofitable, we returned to the laboratory with our four or five buckets of specimens. Then there was the less pleasant chore of mounting and preserving the material — a task which seldom stopped before 10:00 p.m. and usually continued until well after midnight. Well-intentioned friends thought we were being unnecessarily conscientious, but in truth there was no point to bringing back material if it was not going to be mounted, and if it was going to be mounted at all, it had to be done that night, because there would be more collections brought in during the next day. A schedule of long hours such as this could not be kept up indefinitely, of course. As it happens, there are about ten consecutive days during which the low tides occur at convenient working hours and for these ten-day periods we kept up the schedule. Through the next seven days low tides would be either too early or too late for usefulness and our collecting would be concentrated on certain bays where we could expect masses of drifting algae at high tide. Drifting plants were only taken if they were of rare species, or gave some indication of the composition of the offshore communities, or were significant in elucidating the distribution pattern. Consequently, very few large collections were made under such conditions and the subsequent mounting job was fairly light. When foul weather prevented field trips, or during week ends when there was no boatman to handle the launch, the most distasteful task of all was taken up, — transcribing the field notes into permanent note books and making labels.

Dr. Taylor left Bermuda in May after more than three months of intensive but enthusiastic work. I stayed on until June, and returned in August of 1949 and again in November of 1950 to round out a series of observations of the floristic changes accompanying the cycle of the seasons. Few easily accessible areas are so well suited climatically to year-round field studies as is Bermuda, and even fewer have the facilities of a Biological Station to further the work.

An investigation of this nature can not be summed up glibly as a paragraph of "conclusions," but a few of the results can be simply indicated. Two new species of Vaucheria were discovered, as well as a new member of the Chrysophyceae for which a new genus had to be erected. Several unidentified collections are awaiting further search of the literature to confirm their suspected status as new entities, a generic transfer was found to be necessary for a species whose affinities had not been thoroughly understood, and several new records and range extensions will require publication. Almost all of the material has been determined, labelled, and sorted out preparatory to distribution among other repository herbaria. Comprising about 2600 collection numbers, there were more than 11,000 specimens, not including the extensive preparations in fluid preservative for morphological study. The whole collection promises to be valuable as an aid in polishing and correcting the descriptions and keys in Dr. Taylor's manuscript of the Carribbean Flora, but there should be no less value in the proposed accounts of the ecology and detailed distribution of Bermuda algae insofar as they suggest the convenience and versatility of Algae as research material.

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DRS. A. GEOFFREY NORMAN AND GEORGE G. LATIES TO JOIN BOTANY STAFF. — The Department of Botany at the University of Michigan will be strengthened in microbiology and plant physiology by the addition of Dr. A. G. Norman, Biochemist and Division Chief of the Biological Chemistry Corps at Camp Detrick, Md., and Dr. George G. Laties, Senior Research Fellow of the California Institute of Technology, who will join the staff in September of 1952.

Dr. Norman, as Professor of Botany, will direct Phoenix Project No. 32. Formerly he was on the staff of Rothamsted Experiment Station for 4 years and was Professor of Soils at Iowa State College from 1933 to 1937. His work at Camp Detrick has dealt with exogenous growth regulators. Dr. Laties, as Assistant Professor of Botany, will be Research Botanist on Phoenix Project No. 32. He has been associated with the California Institute of Technology since 1947, except in 1949 - 50, when he was a Rockefeller Foundation Fellow at Sheffield and Cambridge Universities in England.

Phoenix Project No. 32 is sponsored by the Dearborn Motors Corporation, who have given an original grant of $100,000. Thomas A. Farrell, President of Dearborn Motors, said the research group will "investigate the absorption of mineral nutrients by plant roots, the effects of trace elements and related aspects of tree and plant physiology". For the first few years, at least, research will be concentrated on the problem of how ions enter plant cells. The project will be administered by a University committee with representatives from the departments of Bacteriology, Botany, Chemistry, Physics, and the School of Natural Resources.

# A TRIP TO A BOTANICALLY LITTLE-KNOWN AREA IN QUERÉTARO

Rogers McVaugh

THE Mexican Plateau, which occupies most of the north-central part of the Republic of Mexico, offers an interesting opportunity for the study of certain kinds of plants and animals which occupy wide ranges but which are confined to restricted habitats that occur relatively infrequently. As a result the species in question are found only in little biological islands scattered over the arid plateau, and the study of the species and their life-histories becomes a study of isolated colonies which often differ interestingly from island to island. The "islands", of course, are the isolated mountain ranges which occur in many places in northern Mexico and which support at the higher elevations a flora and fauna quite different from the surrounding floras and faunas of the deserts and arid plains.

In 1949 I spent almost three months in Mexico investigating this and other field-problems, under the auspices of the Herbarium of the University of Michigan, and aided by a research grant from the Horace H. Rackham School of Graduate Studies. Mr. Robert L. Wilbur accompanied me as field assistant. Our primary interest was in the study of the native black cherry, called in Mexico "capulín", a species which is restricted to the higher mountains, or at lower elevations to moist cañons in the mountains. On the Plateau, from the State of Guanajuato northward, it is one of the "island" species, found in almost every mountain range large and high enough to support a good growth of trees in the cañons, but absent from the intervening territory. One of the things that Bob Wilbur and I were trying to do was to visit a number of these isolated mountain ranges and study the cherries that grew on them.[1]

One day in the city of Toluca we met a fellow North American who had been some time in Mexico as an inspector for the aftosa (hoof and mouth disease) commission, and when he learned what we were seeking he suggested that we visit some of the high areas in northeastern Querétaro, about 200 miles north of Mexico City. We were intrigued, for our topographic maps showed an area there that topped out at well over 10,000 feet, and when our new friend told us that one could drive (in fact, one could go in a bus!) to a place called Pinal de Amoles, we were more than intrigued, for "pinal" means "pine forest", and where there are pines in Mexico there are usually black cherries.

We set out light-heartedly on April 24 from the city of Querétaro

[1] For an account of the conclusions reached in this systematic study of Prunus serotina and its relatives, see Brittonia 7: 279-315. 1951.

with a tankful of gas in our station-wagon (more properly, our Suburban Carryall!). We were not very familiar with Mexican back roads at the time, but we envisioned a trip of 60 or 75 miles to Pinal de Amoles; perhaps 4 or 5 hours counting stops. The first half of the distance was uneventful, for we took the paved road halfway to San Juan del Río, then turned off to the left on a newly graded and gravelled road to Bernal. Ten miles northeast of Bernal, or about 45 miles from Querétaro, our troubles began. We stopped perforce at a disinfection station to let the aftosa guards spray the underside of the car to prevent the spread of the dreaded disease, and while we were walking through the wet disinfectant-soaked sawdust which was designed to cleanse the feet of each passerby we asked one of the military guards if we were on the right road to Pinal de Amoles. He said that we were. How far is it? we inquired. After a moment's thought and some consultation with his fellows he replied that it was about 12 hours' ride. This seemed incredible; here it was noon already, we had come 45 miles and there were only 30 or 40 to go. Twelve hours? Are you sure? He was sure.

This was more serious. We had hoped to get to Amoles well before night, and return to Querétaro the following day, after a good session of botanizing. We continued along a road which got worse and worse. We forded streams and straddled high rocks in the track. We asked everyone we met, how far to Pinal de Amoles? Gradually, through the afternoon, the distance decreased. Sometimes our informants disagreed, but they were always sure of one thing, that we were still a long way from our objective.

Sometime in the afternoon we began to see mountains ahead; dim and hazy, but high and impressive. About the same time the vegetation took a decided change for the worse; it became increasingly more desert-like. We passed through a zone dominated by small leguminous trees and shrubs, chiefly of the genera Mimosa, Acacia, and Cassia.

We ate a late lunch in a deep road-cut where the steep banks and a fringing growth of Celtis pallida Torr. and Vallesia glabra (Cav.) Link furnished the only shade within miles. The latter is a small tree, up to about 10 meters in height; at the time of our visit these were thickly hung with their small ellipsoid white translucent fruits which were not unlike jellybeans in their size and shape. After lunch we passed into an extensive area of true desert, where Larrea and various cacti dominated the scene. The banks of all the steep arroyos were covered with a shrubby composite half as high as a man, with peculiar bluish green foliage and yellow flowers. We were not familiar with it, and of course we did not know at the time but we would have been thrilled to know that we were the first botanists of the 20th Century to see this species growing. We eventually sent a specimen to Dr. S. F. Blake, who at once identified it as Dyscritothamnus filifolius Robinson, previously known only from a scrap collected in 1840.

As Robinson wrote in 1922, the type was a "rather small, poorly dried, much broken and somewhat insect-damaged" specimen in the Berlin herbarium, collected by Ehrenberg in the very region where we found the species to be abundant. It had never been collected again, however, in the 109 years that had elapsed since Ehrenberg's visit, and this, although we did not know it at the time, was our first indication that we were entering a region of rather narrow endemism, where the characteristic species are not widely distributed.

As the afternoon wore on the mountains began to loom larger in the east, and finally as we were losing patience with the desert and the car and the road, we came to the little settlement of Pilón, at the foot of the mountains and 75 miles from Querétaro. It was evident that we should not reach Amoles that night, but we resolved to get as far as possible into the mountains before camping. At Pilón the road began to climb abruptly, by a series of zigzags, first up the bed of a cañon where the traffic was definitely one way and we shook at the thought of what would happen if we met a truck coming down. We climbed in low gear, between steep close-hanging walls with no room to pass. Once we stopped to let the engine cool and collected a few things around a little trickle of water; the bank was overhung with vigorous shrubs of Pluchea odorata (L.) Cass., and along the road we found the weedy Nicotiana trigonophylla Dunal, and Eucnide lobata A. Gray, which a passerby told us was called "pegadora".

Once out of the cañon the road continued to climb in a series of snake-like curves. We alternated between our lowest gear and the next. The road was not bad, because it was used by trucks going to and from a mine at the summit of the great ridge ahead of us, but it was narrow and steep. About 8 miles above Pilón, and still in low gear, we swung around a spur of the mountain and there ahead and above us we saw green, the green of conifers! A cañon with trees, in strong contrast to the bare slopes over which we had been passing, and the north-facing slopes of the cañon were covered with what looked like piñons, or nut pines. It was six o'clock, and at a wide place in the road, at the deepest part of the cañon, we pulled the truck off and made camp as darkness fell, impatient to see what we should find in the morning.

No sooner had we fallen asleep, it seemed, than we began to hear the plodding footsteps of the mine workers, evidently climbing up from the valley below to begin an early shift. Long before daylight we were a bit self-conscious about staying longer in our sleeping bags beside the road, in the face of all this foot-traffic past us. From each man as he went by we heard a murmured "Adiós", the customary invocation of the roadside.

When morning finally came, we found we were in a steep wooded cañon, even better botanically than we had thought the evening before.

The north slope was dominated by the piñons (Pinus cembroides Zucc.), small dark green trees up to about 10 meters high. Mixed with these was the common Mexican juniper, Juniperus flaccida Schlecht. & Cham., and another coniferous tree with pendent leaves and branches, which at first we thought was a second juniper. On close inspection we found to our amazement it was another pine, a nut pine which the people called "piñon blanco", in contrast to Pinus cembroides, which they called "piñon negro". Professor Maximino Martínez later identified our piñon blanco as Pinus pinceana Gord., a rare pine known only from the dry hinterlands of Coahuila and Querétaro.

Among the pines and junipers were various broad-leaved shrubs and trees, almost all unknown to us at the time, but later to prove exceptionally interesting. The largest and most abundant tree was an evergreen member of the rose family, Vauquelinia corymbosa Correa, which was covered with showy corymbs of white flowers. Equally showy but hardly as tall as the conifers was Bauhinia coulteri Macbr., with bright clear pink flowers in great profusion. Other small trees (or large shrubs) were Quercus pringlei v. Seem; Lindleyella mespiloides (H.B.K.) Rydb. (another member of the rose family, with showy white flowers like small roses); Aralia regeliana March.; Sophora secundiflora (Ort.) Lag.; a fiercely holly-like evergreen barberry which is apparently Berberis ilicina (Schlecht.) Hemsl.; and the rare little citrus-relative, Casimiroa pubescens Ramírez.

All these good-sized woody species growing together on the north slopes made quite a dense woodland cover. We saw relatively few herbaceous plants, no doubt partly because of the grazing activities of sheep and goats which we knew were in the vicinity. We did pick up one small orchid, Spiranthes polyantha Reichb. f., under the pines. There were a few small shrubs, including an unidentified species of Forestiera, which looked like some of the species we had known in the United States. The most abundant shrub in this size-class, however, was a narrow-leaved leathery looking plant in clumps a meter high or more, bearing an abundance of last year's black drupaceous fruit. We neglected to make specimens of the fruiting plants, but did collect material which we found coming into flower. The plant reminded us of an Osmanthus, both as to aspect and as to general flower-morphology. Later we spent a great deal of time trying to determine the genus of this remarkable unknown, and at one time planned to describe it as a new Osmanthus. Ultimately we found it to belong not to the Oleaceae but the Verbenaceae; it was the little-known and rarely collected Citharexylum oleinum (Benth.) Moldenke, which for nearly a century was known only from the original collection by Hartweg.

The south-facing slopes, across the cañon from our sleeping-place, supported quite a different vegetation, of a much more xerophytic character. Most of the species were rather widely distributed shrubs found in similar situations in many parts of Mexico. A showy

golden-flowered Acacia, A. farnesiana (L.) Willd., was the most common large shrub, and almost equally abundant was a white-flowered species which we took to be A. mammifera Schlecht. Many of the sunny slopes were covered with thickets, 1 to 2 m. high, of Dodonaea viscosa Jacq., with its green foliage looking somewhat out of place on the dry rocks. On rocks everywhere were small but brilliantly flowering bushes of Tecoma stans (L.) H.B.K., and growing with these we found Jatropha dioica Sessé, a common desert shrub everywhere in northern Mexico. This species, with its stiffly growing rubbery stems, is the familiar "Sangre de Drago" or "Sangregado" of Mexican botanical literature, and the statement is often made that the common name is applied because of the blood-red sap of the plant. We found here, however, as in other areas where the species grows, the abundant fresh juice is clear and watery, with a slight turbidity. The red color, as of dried blood, appears only when the juice dries! Another interesting plant on the sunny rocks was the big shrubby Krameria with compound leaves, K. cytisoides Cav., quite different in aspect from the several species we had known in the United States.

Toward the bottom of the arroyo, especially on the sunny side, we encountered a rather thickly growing assemblage of small trees and shrubs. The largest tree, up to about 10 meters in height, was a Bumelia, covered with attractive cream-colored flowers, which we suppose to be B. altamiranoi Rose & Standl. Various shrubs, including Jacobinia incana Benth. & Hook., Buddleja sessiliflora H.B.K., Stillingia sanguinolenta Muell. Arg. and Asclepias linaria Cav., occupied the thickets in the ravine, and all of these seemed particularly attractive to bees and wasps, so that one almost needed to brush off the insects before putting a flowering branch in the press. Another feature of these ravines was the presence of quantities of Iresine cassinaeformis Schauer, of the Amaranthaceae, a straggling shrub with large drooping white inflorescences.

When we had searched the cañon rather thoroughly, it was evident that we should find no cherries there. We had not really expected them, because elsewhere in Mexico and in the southwestern United States Prunus serotina is most likely to be found on the higher slopes, with the big pines, the pinos, at elevations above the dry slopes where the piñons abound. Accordingly Bob and I started to climb again, still in low gear, but only a short distance above our camp we came to a fork in the road. The right-hand fork continued on up to the mine, visible some distance ahead of us on the ridge. The left-hand road, however, was ours, and as soon as we left the relatively improved road to the mine we understood some of the difficulties that were still ahead of us. Imagine pushing a truck up a road in low gear, and coming upon an abrupt turn of 180°, so short that you have to back the truck to get around it. Imagine a steep drop on one side, with the bottom hundreds of feet below. Remember that the track is one-way, and full of loose

rocks. Add to this a series of projecting ledges that threaten to knock off the bottom of the crank-case and the differential when you pass over them. Only the fact that you know other cars have passed the same way makes it seem possible. We worked our way a mile or so up a "road" of this kind, and finally met a man who informed us that our goal, Pinal de Amoles, was only three leagues away! We were really back in the country now, we thought; distance was no longer measured in kilometers, or in hours, but in leguas, the old Spanish leagues that went out of use officially when Mexico became a Republic. In spite of the seeming closeness of our objective, we resolved to turn back. The road continued bad, and a new obstacle appeared; our gasoline was getting low. Although we had left Querétaro with a full tank, we had not expected to travel most of the time in second and low gear, and we had used much more than we had anticipated. With the nearest gas station 85 miles away, and more than half our supply gone, we decided that we should not try to go any higher. The return trip was uneventful, and we reached Querétaro the evening of the 25th, with full presses but with mixed emotions.

Upon our return to the United States, and after we had had an opportunity to study the plants we had collected on this hurried attempt to reach Pinal de Amoles, it was apparent that we had merely skimmed the surface of an area of unusual interest to botanists. Evidently these dry hills of eastern Querétaro, at elevations between 2000 and 2700 meters, constitute a part of an important area of endemics which has hardly been visited by biologists. The relationships of the principal species are with those of similar areas extending from southern Coahuila across Querétaro into Hidalgo and Puebla. "Rare" species like Dyscritothamnus filifolius are not rare here, but abundant and perfectly at home, and further study of the biology of these areas should shed much light upon the present distribution of the Mexican biota, and even more important, upon the past history of the flora and fauna and the factors which control their spread. We hope that we, or others, can return to these fascinating mountains and deserts for further study, but we know now that minimum necessities include a truck with four-wheel drive or at least an extra low gear, heavy tires, and plenty of extra gasoline!

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Word has just been received that Robert L. Wilbur has been appointed Assistant Professor of Botany at the University of Georgia, at Athens, for the academic year 1952 - 1953. He will assume his new duties this fall, and hopes to continue research on the flora of the southeastern United States, in which he has had a long-continued interest. Lately he has been concerned with a taxonomic revision of the genus Sabatia, of the Gentianaceae, which is a conspicuous and abundant group in the Southeast.

# A BOTANICALLY INTERESTING SANDHILL AREA IN WESTERN TEXAS

Rogers McVaugh

MY introduction to a most peculiar flora came in 1945, when I was returning late in July from a month's work in Trans-Pecos Texas. Between Grandfalls and Crane, in Crane County, Texas, the highway passes through an area in which the most conspicuous woody plant is the "shinnery oak", Quercus havardi Rydb., which here forms a "forest" mostly less than a meter high. The acorns of this species are disproportionately large (up to 2.5 cm. long), and the whole aspect of this dwarf forest covered with great fat acorns is disconcerting, to say the least, to one accustomed to larger trees. The soil in which the oaks grew appeared to be almost pure sand, and it supported a fairly large herbaceous flora, in rather striking contrast to the arid alkaline plains a few miles further west.

Upon my return to a botanical library, I found that this whole sandhill area of the southern Llano Estacado of Texas had been called by Dr. Tharp the "Sandy South Plains"[1]. It is a region of deep sands, extending from Crane County (with isolated sandy areas further east) northward and northwestward in Texas and adjacent New Mexico. Some of the most striking and botanically interesting areas in Texas are in Ward, Winkler and Andrews counties. Much of the white or pale yellow sand has been piled into high dunes, many of which are still actively blowing and moving. Some of the dunes have been stabilized by vegetation, and are currently covered by thickets of shinnery oak. Great stretches of open sand alternate with oak-topped sand ridges, and the general impression upon the observer is one of great scenic beauty, and almost unspoiled wilderness. Because of the scarcity of palatable forage the area has been relatively little grazed, and because of this and the monotonous rolling sandhill topography, almost devoid of landmarks, one can walk a few hundred paces from a paved highway and imagine himself isolated from all human contacts. In fact it is almost painfully easy to lose oneself among the dunes when the sun is high and each ridge looks exactly like every other one. Fortunately the botanist can usually pick out an oil well, or the smoke of a carbon-black plant, by which to orient himself in the wilderness of sand.

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[1] Tharp, Benjamin Carroll. The Vegetation of Texas. xvi, 74 pages. 1939.

In 1947, on a second visit to Texas[2], I learned from Dr. L. C. Hinckley of Sul Ross State College that there was reputed to be in the sandhills near Kermit, in Winkler County, an extensive "plum thicket". Tradition had it that in good plum years some whole families made it their business to trek into the sandhills and bring out the fruit by the wagon-load. I was much interested in this report, for the nearest native plums, as far as I knew, grew in Mitchell County, approximately 140 miles to the east; in Bailey County, about 160 miles to the north; and in Jeff Davis County, almost 100 miles to the southwest. Furthermore, these known plums belonged to three different species, which made the Winkler County unknown harder to guess in advance. Dr. Hinckley also had talked with persons who reported that in the high dunes there were interdunal hollows which remained more or less permanently wet, and naturally I was agog to explore these areas for interesting plants. On May 5 and 6, therefore, in company with Mr. A. M. Harvill, Jr., I made some preliminary explorations in the dunes and sandhills near Monahans, Ward County, and talked with persons who knew personally of the existence of the plum thicket near Kermit. We even learned of its approximate location, northeast of Kermit, and on a broiling hot day we attempted to get to the spot by car. We were stuck in the sand several times, however, before reaching the ranch which was our destination, and we finally had to return to Monahans empty-handed. The following day we set out on a predetermined schedule for Del Rio, and the 1947 field season ended without giving us a glimpse of the elusive plums.

In 1949, after the completion of field work in Mexico (see the preceding paper in this magazine), Bob Wilbur and I returned to the United States late in May, through western Texas, and spent several days in the mountains of the Trans-Pecos area, where we were successful in finding the little-known endemic bush-plum, Prunus murrayana E. J. Palmer, in several localities in the Sierra del Norte and in the Davis Mountains. Spurred on by this good fortune, we decided to make another attempt at the Winkler County plum-thicket, and on May 28 we set out from Kermit on the new highway to Andrews, determined to find an oilman or a rancher who could give us proper directions.

Our first day's search failed to yield any plums, but we found we were on the track of the wet interdunal hollows of which Dr. Hinckley had told me two years before. Much to our surprise, Bob and I found that while many of the dunes and ridges were capped with small oaks the deeper hollows between the dunes supported rather large numbers of small but definitely treelike willows (Salix gooddingii Ball) up to 5 meters in height. Willows seemed to us to be good indicators of a permanently moist subsoil, but here we found no associated species with similar preferences.

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[2] For complete itineraries of 1945 and 1947, see Field & Lab. 17: 123-142. 1949.

The more level areas among the dunes supported a fairly dense plant-cover in which grasses and sedges played a dominant part. The most abundant grasses were Aristida purpurea Nutt., Eragrostis oxylepis (Torr.) Torr. and E. sessilispica Buckl., Cenchrus pauciflorus Benth., Paspalum stramineum Nash, and Munroa squarrosa (Nutt.) Torr. The quite un-grasslike mats of the last-named species nearly covered the sand in some areas. Less abundant species were Aristida longiseta Steud., Brachiaria ciliatissima (Buckl.) Chase, and Bouteloua hirsuta Lag. Absent, or at least not evident at the time of our visit, were the various species of Andropogon and Bouteloua which are so often conspicuous on the plains. Interspersed among the grasses were several species of Cyperus, notably C. uniflorus Torr. & Hook., C. schweinitzii Torr., and what we took to be C. setigerus Torr. & Hook. with very immature inflorescences. Herbaceous dicotyledons were abundant too, including some rather ephemeral annuals like Cristatella jamesii T. & G., Phyllanthus abnormis Baill., Houstonia humifusa A. Gray, and the curious euphorbiaceous Reverchonia arenaria A. Gray, with fleshy leaves and peculiarly colored dark brownish-red flowers. Perennial dicots were few and scarce; the three species noted were Krameria lanceolata Torr. Cryptantha jamesii (Torr.) Payson, and Astragalus mollissimus Torr.

An almost entirely different flora prevailed in some of the nearby hilly areas in the dunes. On these relatively unstable sandhills the grasses and grasslike plants seemed to play a minor part in vegetating the area, and in further contrast to the level grassy areas, the conspicuous plant-species in the sandhills were mostly herbaceous perennials. The showiest perennials at the time of our visits were the infamous Texas bull-nettle, Cnidoscolus texanus (Muell. Arg.) Small, and a lovely pink-and-white Penstemon (P. ambiguus Torr.). The bull-nettle is one of the handsomest of plants, with abundant dark green foliage and large very fragrant pure white flowers. Its beauty, however, is deceptive, for the whole plant is covered with stiff and painfully stinging hairs which make it impossible to collect specimens without the protection of leather gloves, and which produce burning lesions of some hours' duration on the unwary botanist who brushes against them.

The above species are most abundant on the low hills where also occur the little shrubby oaks and the mesquite, Prosopis chilensis (Mol.) Stuntz. The latter grows here into a small tree which furnishes the only shade in the area. Other conspicuous and usually tall perennial plants in flower at the time of our visit were Lithospermum incisum Lehm., Tradescantia occidentalis (Britton) Smyth, Oenothera serrulata Nutt. (here a shrub up to 1 meter high, with showy bright yellow flowers withering after noon), Stillingia sylvatica L., Penstemon buckleyi Pennell, Abronia fragrans Nutt., Hoffmannseggia jamesii T. & G., and, unexpectedly, the herbaceous vine Maurandya wislizeni

Engelm. Equally showy were some of the smaller annuals and biennials like Phacelia robusta (Macbr.) Johnst., Dithyraea wislizeni Engelm., Erysimum asperum (Nutt.) DC., Eurytaenia hinckleyi Math. & Const., Othake sphacelatum (Torr.) Rydb., Heliotropium convolvulaceum A. Gray, Oenothera engelmanni (Small) Munz, and a tall Mentzelia with white flowers which opened just before sundown. Less conspicuous here than in the grassy flats, because of the great abundance of showy-flowered species, but probably equally abundant, were several smaller species of herbs, including Houstonia humifusa (which seemed to dot all the sands with its little tufts showing small pink flowers), Loeflingia squarrosa Nutt., Plantago purshii R. & S., Cryptantha crassisepala (T. & G.) Greene and C. micrantha (Torr.) Johnst., and Erigeron divergens T. & G.

Amid all this abundance of species new to us, Bob and I did not waste our time on our first day in the sandhills. Toward the end of the day, moreover, we obtained what seemed to be authentic information about the way to the plum thicket, and the following morning, May 29, we set out from Kermit to the north, toward the carbon-black plant that made a fine landmark because of the continuous pillar of soot that arose from it. We took the road past the plant to the east, as far as the point where the auto track ended abruptly at the edge of the sandhills, and from here we struck off on foot across the rolling dunes.

Not more than a few hundred paces from the car we descended from the steep leeward slope of a blowing dune into a hollow which seemed from above to have grass at the bottom of it, and here we struck botanical gold! We found ourselves actually in one of the semi-permanent moist spots of which Dr. Hickley had heard. The aspect of the little hollow was like that of a swale anywhere in the southeastern Coastal Plain; the ground was covered with a turf in which tall grasslike plants predominated. The principal species were Scirpus acutus Muhl., Rhynchospora globularis (Chapm.) Small, Eleocharis montevidensis Kunth, Juncus biflorus Ell. and J. scirpoides Lam., and Panicum sphaerocarpon Ell. Prominent among the grasses and sedges were Lechea villosa Ell., Gnaphalium chilense Spreng. and a species of Buchnera, as yet unidentified but growing here far outside the known range of the genus. Our most exciting find here, however, was made when we were digging some of the other species: Ophioglossum petiolatum Hook., usually hidden among other plants, but abundant. Any species of Ophioglossum is interesting to find in the field, and here in the sand dunes it seemed quite out of place.

After some time spent in taking in the sights that this little sand-encircled swale had to offer, and collecting all the species that grew there, Bob and I set off again to look for the plum thicket. Actually we never found anything that could be called a "thicket" of plums, and doubtless it is still back there in the dunes, along with many other interesting finds for the ambitious field-botanist. We did find plums,

however, but they seemed almost an anticlimax after Ophioglossum, Buchnera and Rhynchospora. Suddenly on a bare dune-slope, along with willows and the shinnery oak, we found a few plants of Prunus angustifolia Marsh., loaded with fruit and apparently perfectly at home here in the sand, hundreds of miles from the Coastal Plain areas where the species is most abundant. Growing in the vicinity were species we had not seen in the sandhills before, including an abundance of the shrubby Baccharis emoryi A. Gray, a luxuriant herbaceous growth of a linear-leaved Apocynum sibiricum Jacq., and a conspicuous golden-flowered Helianthemum which turned out to be H. georgianum Chapm. Loaded with specimens, and with sunburned faces and sand-filled shoes, we called our quest for plums a successful one and returned to our car in triumph.

A little study of the strange mixture of species which are associated in these Texas sandhills leads one readily to the conclusion that the sandhills themselves, rather than any climatic factors, have influenced the distribution of many of the plants which grow there.

One element in the sandhill flora, namely that group of species which seem to have affinities with those of the southeastern Coastal Plain, interests me the most. The mid-continental sandhills comprise an area which is isolated from other, edaphically similar areas further east, by some hundreds of miles of semi-arid short-grass plains, alkaline flats, and stony mesquite- or juniper-covered hills. It is true that some of the sandhill species (e.g. Eriogonum annuum) occur almost everywhere across Texas on sandy roadsides and similarly disturbed places, but for the less adaptable plants these unfavorable habitats seem to constitute a very real barrier, and many species undoubtedly occur in markedly disjunct areas, with their major areas in the southeastern Coastal Plain and a much smaller area in the sandhills of Texas and adjacent New Mexico.

Take as a particularly interesting example the case of Prunus angustifolia, the Chickasaw plum. This shrubby and early-fruiting species is common on the Coastal Plain from southern Maryland to eastern Texas, and in the western part of its range it extends inland to Kansas and the Texas panhandle. Its distribution in western Texas is shown more in detail on the map (Fig. 1.). Note that between the locality in Winkler County and the next to the east (in Mitchell County) there is a distance of almost 150 miles. It seems probable that there are few if any localities between where plums could grow. The Rhynchospora cited above presents a case equally interesting; R. globularis was known to Gale, in her recent revision of the genus, only from as far west as eastern and central Texas. Helianthemum georgianum is not known to occur between Taylor County and Winkler County, a gap of some 200 miles. Panicum sphaerocarpon is unknown between Winkler County and eastern Texas. Buchnera floridana reaches its previously known western limit in Valverde County, some

250 miles southeast of the Winkler County sandhills; my number 10734, from these sandhills, seems to be either B. floridana or an undescribed entity.

Other sandhill species which seem to have their affinities further south and east are Cnidoscolus texanus, Stillingia sylvatica, Juncus biflorus and J. scirpoides, and Lechea villosa.

There is no doubt that further botanical work in the sandhills in Texas and adjacent New Mexico would bring to light many additional records of these and other species, of varied geographical affinities. Detailed studies of these peculiar habitats would be very worthwhile indeed, and it is to be hoped that the Texas botanists can soon find opportunity to make such studies and give us the results of their findings.

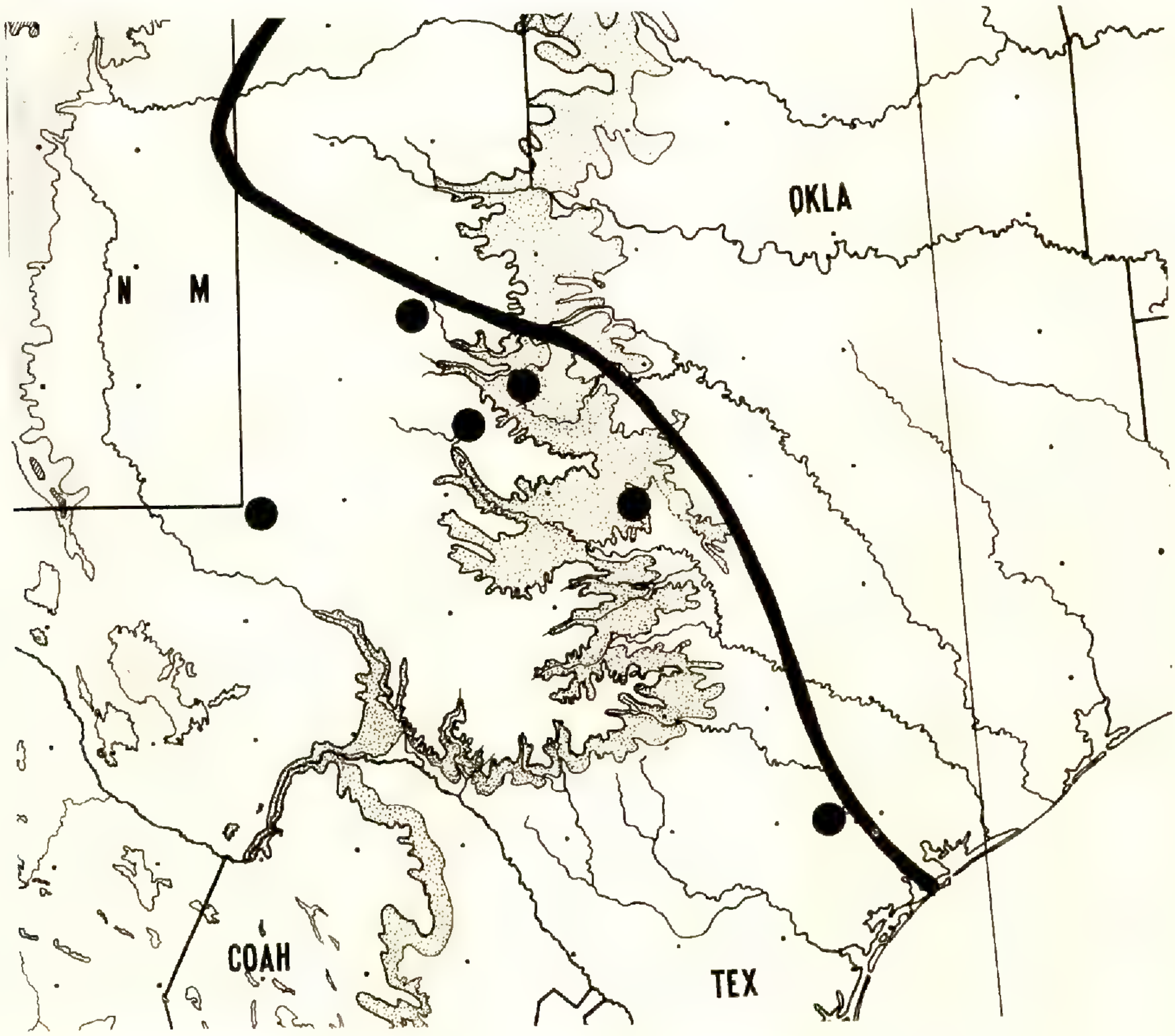


Fig. 1. Southwestern limits of Prunus angustifolia Marsh. The heavy line indicates approximately the limit shown by Wight in 1915 (Wight, W. F., Native American Species of Prunus. U. S. Dept. Agr. Bull. 179: map, p. 35.). The dot near the southeastern corner of New Mexico represents the Winkler County locality, and the other dots, reading from north to south, represent collections in Crosby, Fisher, Mitchell, Brown, and DeWitt counties.

# THE CONVENTION OF THE CACTUS AND SUCCULENT SOCIETY OF AMERICA; DENVER, JULY, 1952

Sister Marie Fidelis Remski, I. H. M.

MOST people aren't thrilled about a convention, but I am. Most people forget it about as soon as it takes the convention program to find its way into a waste-paper basket, but I don't. Of course, there are conventions and conventions, but I am speaking of a very special one, — convention of the Cactus and Succulent Society of America, held in Denver last summer. The people, the place and the plants made it an occasion to be remembered for a long time.

First of all it was friendly. No matter who you were, where you came from, what your business was, you were welcome. You felt it sincerely in every smile, in every handshake, in every word of greeting. You loved cacti and succulents and so did everyone else. Nothing else mattered. It was very interesting to meet people whose books and articles you had read, whose harrowing collecting experiences you had heard about, whose gardens had won fame from west to east. There was Mr. Howard E. Gates, the chairman, of the Famous Gates Cactus Gardens, Corona, California. His congenial manner, winning smile and simple exterior masked a wealth of knowledge both practical and theoretical. Mr. William Taylor Marshall, scholarly author of several books on cacti, director of The Desert Botanical Garden, Tempe, Arizona, was truly an inspiration. Though so well versed himself, he seemed to realize that there was always more to be learned from others. Dr. Elzada Clover of our own University of Michigan, radiated her usual cordial friendliness, and contributed a feeling of professional dignity and solidity. A prominent cactus enthusiast, Mrs. Frank Cariss of California, showed how one could blend to great advantage the care of a home and such a worthwhile avocation as collecting, growing and studying cacti. Mrs. Harry Johnson was another of those to be highly commended for her achievements in the double rôle of keeping house and assisting at the Johnson Cactus Gardens, Paramount, California. Congratulations are in order for Mrs. Elizabeth Eckstein on the fine collection of all native Colorado cacti which she has growing in the gardens of her unique home "The Cactus Shack".

The Denver host group deserves special mention. To cite only one example of their kindly hospitality, their solicitude for the visitors and their efficient management in making the convention a success, there was the feeding of a large field-trip hungry group, miles from home, for two days and that achieved to the satisfaction of all! There were several college students whose studies had led them into joining.

They soon realized that here were both amateur and professional botanists who were exceptionally well versed in their field, with knowledge that they had acquired by dint of hard work, but which they imparted unstintingly. No one kept secret his own "trick of the trade". Experiencing their cordial good will and helpfulness was an inspiration. They all reflected the happiness and enjoyment that they received from fostering their good, wholesome activity whether they were scientific botanists, commercial collectors, horticulturists, amateurs or hobbyists.

Since it was a convention, there were talks and discussion groups. There were few formal speeches. Everyone had the attitude of being eager to learn more about something that was very significant to him. His problems would either be solved or he got the consolation of knowing that others had the same difficulties, and of finding out how they met them.

On the last two days there were conducted field trips. The drive south from Denver through Colorado Springs en route to Cañon City was most picturesque. Those who know that scenic part of our country will understand what a joy it was to see it the first time. To those who have not had this great fortune, we would say simply that even the most brilliant pictures of it are no exaggeration. While they depict the beauty of the landscape, they do not capture the feeling of the overwhelming grandeur of the Rocky Mountain ranges, the canyons, the vast coniferous forests. The roadsides were studded with many showy flowers. One of the most common genera was Penstemon. It was interesting to notice that near Denver the flowers of Penstemon were deep pink, then there was a transition zone of pink and white ones, and in southern Colorado they were all pure white. There were Yucca lilies of all sizes. Near Denver they were in full bloom and farther south they were in fruit. There were literally fields of wild sunflowers along the way which made a most attractive sight as they faced the bright Colorado sun. The white prickly poppy appeared as a weed in many places. The mountain meadows were veritable fairylands. The columbine, Colorado's state flower, was specially notable for its enormous size. The large forget-me-not plants were vastly different from our garden types.

Our first cactus hunt was on Wakefield Ranch, a few miles from Cañon City. Oh, the thrill of seeing cacti in their natural habitat! There was Opuntia arborescens Engelmann. It is a cylindrical type, some plants about three to four feet high and several feet in diameter. Many of the plants, in full bloom, their rose-colored flowers with numerous yellow stamens, made a beautiful sight. Opuntia polyacantha Haworth, a flat-stemmed type, was plentiful too. This is rather low growing or procumbent, lying prostrate on the ground in many places, and making itself known to inexperienced collectors in other ways than by the display of its beautiful yellow flowers. Opuntia phaeacantha

Engelmann and Opuntia hystricina Engelmann were found by different members of the group. The terrain was covered with shale, small and large boulders. It was most interesting to see the different kinds of lichens on these boulders. It was quite evident that a great work was done by these small plants in disintegrating the rocky masses. The only so-called trees of this region were juniper and arbor vitae about four or five feet high. Their gnarled trunks told the story of the many years they had struggled for existence.

After visiting the Royal Gorge on the next day, we proceeded to the Wet Mountain Valley regions for more collecting. Here we found the smaller, globular types of cacti, namely, Echinocereus triglochidiatus Engelmann, Echinocereus viridiflorus Engelmann, Pediocactus Simpsonii (Engelmann) Britton & Rose, Sclerocactus Whipplei (Engelmann & Bigelow) Britton & Rose, and Coryphantha vivipara (Nuttall) Britton & Rose. What an experience to find mounds of cacti on the sides of mountains! How amazingly some of them grew between the stones, their roots pressed practically paper thin! On the plateau portions, cacti were actually recessed in the ground, and since they are of the same color, they were very difficult to find. Finding cacti is only part of the feat of collecting. Digging, bagging and transporting them requires equal skill so that there will be no harm to either plants or collector.

All things come to an end and so did our Convention. Do you wonder that I am not forgetting it?

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The Cactus and Succulent Society is an international, non-profit organization with members in almost every country in the world. Its sole purpose is to stimulate interest in cacti and succulents and to record such information in The Cactus and Succulent Journal. Through the Journal, the official magazine of the Society, members are kept in touch with all the activities of the organization, and are informed of the progress that is made in the study, cultivation, and discovery of succulent plants. It is published bi-monthly. The last issue, Vol. XXIV, No. 2, Mar. - Apr., 1952, contained the following interesting articles: A Cactus Collector in the Andes by Harry Johnson; There IS Interest in Cacti; Desert Botanical Garden by Scott E. Haselton; Spine Chats by Ladislaus Cutak, Curator of Cacti and Succulents at the Missouri Botanical Garden. Membership and subscription are $3.00 per year, North and South America; $3.50, foreign. Mail application to Scott Haselton, Editor, 132 West Union Street, Pasadena 1, California.—Eds.

# BOTANICAL SOCIETY OF AMERICA
# CENTRAL STATES SECTION
## Annual Foray, August 18-20, 1952
## Iowa Lakeside Laboratory, Milford, Iowa

THE Central States Section, Botanical Society of America, has just completed plans for an August foray in the Lake Okoboji region of North Central Iowa. The annual business meeting and election of new officers for the section will be held during the period of the foray. Registration will begin at Iowa Lakeside Laboratory, Milford, Iowa, Sunday, August 17. Several interesting aquatic and prairie locales will be visited during the following three days. Registrants will be provided with a complete itinerary and papers on the flora of the area. All are welcome to attend. Reservations for accommodations and inquiries about the foray may be addressed to H. S. Conard, Chairman of the Program Committee, Lakeside Laboratory, Milford, Iowa.

The area to be studied lies within the latest glacial drift: The Mankato Stage of the Wisconsin Glaciation. All of the plants are immigrants or, in some sense, relicts. Tall grass Prairie (Andropogonetum, Stipetum) originally occupied the drained flatlands. Some good stands still persist. Communities of Spartina pectinata, Typha spp., Scirpus spp., Phragmites, Zizania and Carex spp. cover the ponds and lakes in the glacial moraines. The algal vegetation is fabulously rich with hundreds of species. Elements of short-grass vegetation occur on morainic knobs. Opuntia and Talinum inhabit glaciated beds of quartzite. Oakwoods and elmwoods flourish on protected slopes.

Persons going eastward after the Foray may elect to see other woodlands and prairies, and the Driftless Area, in a personally conducted tour.

Collecting will be restricted at certain places only. The Laboratory has facilities for study and preservation of material.

To reach the Laboratory, motorists will go to Milford, Iowa, and thence north on U. S. 71 and Iowa 32, or to Spirit Lake and thence west on Iowa 9 and south on 32. (See road map of Iowa.) Others will come by bus or rail, and will be met at Spirit Lake, Milford, or Spencer.

Room and board will be provided at Iowa Lakeside Laboratory. Cots or beds and mattresses only are furnished by the Laboratory. Visitors will bring towels and bedding as desired, including sufficient blankets for nights with temperatures as low as 40°F. — Robert S. Hulbary, Secretary.

# NEW RECORDS OF FLESHY FUNGI FROM THE VICINITY OF THE UNIVERSITY OF MICHIGAN BIOLOGICAL STATION AND TAHQUAMENON FALLS STATE PARK IN MICHIGAN

Alexander H. Smith

DURING the seasons of 1946, '47, '49, and '51 the writer collected fleshy fungi intensively in the northern tip of the southern peninsula with headquarters at the University's Biological Station on Douglas Lake, and in 1949, during late August and on into September, made frequent trips to the Tahquamenon Falls State Park in the Upper Peninsula. During the season of 1951 from late June to the middle of September, weekly trips were made to the Tahquamenon Park because its flora, previously, had been found to be of exceptional interest.

The agarics of Michigan have received a lot of attention, particularly by Kauffman (1918). However, most of his collecting was done in the southern part of the state, with the result that our northern flora was rather badly neglected. Through the cooperation of the Herbarium and the Biological Station, an arrangement was made whereby the facilities of the Station were available for mycological research. It soon became very evident that before much work of a diversified nature could be carried out on our northern fungi, a taxonomic survey had to be made, because of the large number of new and interesting taxa which turned up, and had not been reported or adequately described.

This paper deals with new records for Michigan, but a few reports of very rare fungi previously reported are also included. Since the species included here are well described in the literature extensive descriptive notes are not given. Instead, following the authority for each species name, in parentheses, is the citation of the work which includes the description of the species with which the specimens were checked. In a relatively few instances, for very well known species, this was not done because the identification was not based upon any one particular description.

Since 1935 I have been collecting intensively in the Pacific Northwest in order to bring together materials for a manual of the agarics of our western states. It has been interesting to compare the agaric flora of northern Michigan with that of the Pacific Northwest, and of course careful records were made of any so-called western species which occurred here. The indications are that a careful study of the agaric flora of the Great Lakes Region will shed light on some of the problems of distribution in this group.

One of the striking differences between the fruiting pattern of agarics in northern Michigan and the Northwest is that many of those which fruit sparingly here, fruit in quantity on the coast during seasons of comparable rainfall and temperature, such as that of 1951. In the past there has been some speculation as to why so many European species occurred in the Pacific Northwest and not in the Great Lakes Region and eastern North America. There was a tendency to class such fungi as part of a typical "western" flora even though they were not endemic. However, as we find more of these in the Great Lakes Region and fill in the gaps in distribution it appears logical to interpret the recent Michigan records as mostly of species belonging to a northern circumboreal element which is more abundant in terms of number of fruiting bodies in the Northwest because of the exceptionally favorable conditions which prevail there. However, such species as Boletus mirabilis, Mycena tenax, Cystoderma fallax, and Hygrophorus subalpinus do appear to represent a typically western element in the agaric flora, so that their presence in Michigan indicates a parallelism between the distribution of the seed plants and the fleshy fungi in this regard. There is also a true eastern North American element represented by such fungi as Mycena leaiana, and other species, some of which have only been discovered recently and will soon be described. To characterize the northern Michigan agaric flora briefly, on the basis of the work so far, one would say that it appears to be preponderantly a northern, circumboreal flora with a characteristic western, and a similar combined northeastern and Great Lakes element. The southern species, such as Lactarius paradoxus, to be treated in detail elsewhere, make up the most unusual element, and may represent a southern element.

## List of Species

Armillaria decorosa (Pk.) Smith & Walters (1947). The collection was obtained from a decaying hardwood log at Tahquamenon Falls State Park, Luce County, Sept. 5, 1949 (Smith 33337). If somewhat weathered, this fungus is easily passed by because of the superficial resemblance to the common Pholiota squarrosoides. It is a rare species endemic to northeastern North America.

Armillaria ponderosa (Pk.) Saccardo; (Smith, 1950). It was abundant under Pinus Banksiana at Whitefish Point, Sept. 7-9, 1951 (Leathers & Smith 38412 and 38575). This species is common in the Pacific Northwest, often under Pinus contorta. The characteristic cinnamon-like odor was present in the Whitefish collections.

Armillaria Zelleri Stuntz & Smith, in Smith (1950). This characteristic species of the Pacific Northwest was collected at Wilderness Park, Emmet County, Sept. 24, 1949, and Whitefish Point, Sept. 7, 1951

(Smith 38415). It occurred in a mixed stand of aspen, balsam and spruce in the Big Stone Bay Area at Wilderness, and at Whitefish Point it was under Pinus Banksiana.

Asterophora parasitica (Fr.) Singer. Found on an old mushroom fruiting body in a bog on the east shore of Burt Lake, Sept. 11, 1951, (Smith 38706). This species is well known because of the smooth chlamydospores, but this is the first collection I have seen from our state. The "common" agaric parasite with us is the rough spored A. lycoperdoides.

Boletus gracilis Peck. This fungus was collected in various places as follows: Colonial Point, Burt Lake, Aug. 1, 1951 (Smith 37335); Aug. 9 (Smith 37555); Carp Creek, July 6, 1951 (Harry Thiers 742); July 27 (Thiers 974) and Aug. 10 (Thiers 1210); Tahquamenon Falls State Park, Aug. 6, 1951 (Smith 37408) and Aug. 21 (Smith 38059). This well known bolete is represented by one collection from Michigan among Kauffman's material, and until the work in the vicinity of the Biological Station was started in 1946 I had not found it in the state. It is not uncommon in association with hemlock during wet seasons.

Boletus mirabilis Murrill; (Smith 1950). Found on a decaying hemlock log, Tahquamenon Falls State Park, Sept. 9, 1951 (Smith 38627). This characteristic bolete of the Pacific Northwest, where it occurs on rotten conifer logs, was a pleasant but not unexpected surprize in view of all the other western species which have been recorded from the Tahquamenon Area.

Boletus Ravenelii B. & C. In open mixed oak-pine woods, east shore of Burt Lake, Aug. 4, 1951 (Smith 37373). A second collection was made by Harry Thiers at Tahquamenon Falls State Park, Aug. 13, 1951 (Smith 37841). The species appears to be rare in this state, but may be more common than we think when the northern flora is better known. Douglas Grubb photographed good material from the Upper Peninsula, but the specimens were not saved.

Clitocybe Alexandri (Gillet) Konrad; (Smith,1944). Previously this fungus was known in North America along the Pacific coast from Washington to California. In Michigan it was found in Reiman's Bog, east of Burt Lake, Cheboygan County, Sept. 18, 1950 (Thiers & Smith 34947); Miller's Bog, east of Burt Lake, Sept. 20, (Thiers & Smith 36013).

Clitocybe maxima (Fr.) Kummer; (Smith, 1944). Collected in Miller's Bog, east shore of Burt Lake, Sept. 20, 1950 (Smith 36018). It grew gregariously under birch, aspen and conifers. As pointed out previously (Singer & Smith, 1943), Kauffman's report under this name applies to Leucopaxillus tricolor. The resemblance to Clitocybe infundibuliformis is striking, and without question both belong in the same stirps. The pilei of C. maxima finally become very broad (about 30 cm.) and flabby, in which state they dry poorly and make unsatisfactory herbarium specimens.

Clitocybe parilis (Fr.) Gillet; (Lange, 1935). In mixed woods at the Upper Falls, Tahquamenon Falls State Park, Sept. 2, 1949 (Smith 33274). This fungus is common in the river valleys of the Pacific Northwest where red alder and cottonwood are abundant.

Collybia cylindrospora Kauffman; (Smith 1944). This fungus resembles Collybia confluens in general aspect, but has distinctly broader and more distant gills. It was described from Mt. Hood, Oregon and collected in Michigan at Mackinaw City Hardwoods, Aug. 29, 1949 (Smith 32736); Tahquamenon Falls State Park, Sept. 11, 1949 (Smith 33527).

Collybia lacerata (Lasch) Berkeley; (Smith & Hesler, 1940). It was found at Ann Arbor, Aug. 16, 1942 (Smith 18726) and in Rees' Bog, Cheboygan County, July 20, 1946 (Smith 21921). The Ann Arbor collection was from an oak stump, whereas the Rees' Bog collection was from an old conifer log. Collybia abundans and C. familia can be readily distinguished by their smaller globose spores.

Cortinarius rainierensis Smith & Stuntz (1950). This recently described western agaric was found in two localities, Carp Creek, at north shore of Burt Lake, Aug. 3, 1951 (Thiers 1091), and Tahquamenon Falls State Park, Aug. 13, 1951 (Smith 38150). It occurred scattered under hemlock in both places.

Cortinarius traganus Fries; (Smith & Wehmeyer, 1936). This rare species was one of the most abundant agarics in the pine barrens around Whitefish Point during September in 1951 (Smith 38419, 38578, and 38796). All collections had a characteristic though faint spicy odor.

Cystoderma Ambrosii (Bres.) Smith & Singer; (1945). Found once at Tahquamenon Falls State Park, Sept. 19, 1949, collected by Edward Chmielewski (Smith 34020). Previously this fungus was known in North America only from the Santiam River drainage of the Central Cascade Mountains in Oregon.

Cystoderma fallax Smith & Singer (1945). This species usually has a beautifully developed annulus, much as in C. granosa, but it is terrestrial rather than lignicolous. It is one of the common species of the Pacific Northwest, and was found in Michigan in two localities, Tahquamenon Falls State Park, Sept. 19, 1949 (Smith 33956), and Mackinaw City Hardwoods, Sept. 16, 1950 (Smith 35878).

Cystoderma subvinaceum Smith; (Smith & Singer, 1945). The chemical characters (green in KOH on the cuticle of the pileus) were constant and distinct. It was collected at Tahquamenon Falls State Park, Sept. 11, 1949 (Smith 33513), on a hemlock log, and again on debris in mixed woods on the east shore of Burt Lake, Sept. 20, 1950, collected by Harry Thiers (Smith 36017).

Hygrophorus albidus Karst; (Smith & Hesler, 1939). Single to

gregarious, especially, under conifers, Tahquamenon Falls State Park, Sept. 11, 1949 (Smith 33535); Millers Bog, east shore of Burt Lake, Sept. 20, 1950 (Smith 36028); Tahquamenon Falls State Park, Aug. 23, 1951 (Smith 38146 and Sept. 7, 38537). It was first reported for North America on the basis of very meager material. Since then extensive collections from the Olympic and Cascade Mountains, especially Mt. Rainier National Park and around Mt. Hood in Oregon, have shown that the species is relatively common in those regions and that when it fruits under optimum conditions the carpophores resemble in stature those of medium-sized species of Limacium rather than H. borealis, as we originally pointed out. This fungus was found in Michigan during three successive seasons and was identical with the western collections.

Hygrophorus camarophyllus (Fr.) Dumée; (Smith, 1950). Two collections were made at Tahquamenon Falls State Park, Sept. 7, 1951 (Smith 38535), and Sept. 11 (Smith 38794). Both times it was found in a mossy area in a stand of hemlock. The specimens all lacked an odor, and hence differ from material previously reported from Ontario. They were identical in every respect with the odorless form common in the Pacific Northwest.

Hygrophorus canescens Smith & Hesler (1942). Single in mixed forest near the upper falls, Tahquamenon Falls State Park, Sept. 7, 1951 (Smith 38537). This is apparently the first report of the species since it was described from the Great Smoky Mts. National Park.

Hygrophorus erubescens Fries; (Smith & Hesler, 1939). This was collected at Tahquamenon Falls State Park Sept. 19, 1949 (Smith 34057), and again on Aug. 21, 1951 (Smith 38058). Both times it was on low ground under hemlock and birch near the edge of a bog. It appears to be one of those rare species which, when it fruits, appears in quantity, but it does not appear every year. I found it abundant on the West Coast during the season of 1937.

Hygrophorus marginatus var. olivaceus Smith & Hesler (1942). This variety was described from Mt. Baker National Forest in the Cascades, but is not uncommon in the Douglas Lake Region during summers when the rainfall is heavy. We found it scattered to gregarious under second growth hardwoods, University Biological Station, Douglas Lake, July 26, 1951, Henry Mukai (Smith 37126). This collection was slightly viscid when moist, and a few giant spores 10 - 12 $\mu$ long were found, but all other characters including the lack of clamp connections were clearly those of var. olivaceus.

Hygrophorus nitratus Fries; (Smith & Hesler, 1942). A single fruiting body was found in a wet, mixed forest, Tahquamenon Falls State Park, July 30, 1951, Smith 37312. In this collection the nitrous odor was strong, the gills and stipe were pallid and there was no tendency to stain reddish.

Hygrophorus subalpinus Smith (1941). Under Pinus Banksiana, Whitefish Point Region, Sept. 9, 1951, Smith 38581. This collection has

spores (8) 9-11 x 5-6$\mu$ as contrasted with 8-10 x 4.5-5 in the type. In Smith 34709 from the Medicine Bow Mts. of Wyoming, July 12, 1950, the spores measure 9-12 x 5-6.5$\mu$. The distinguishing features are the dry stipe and fibrillose dry partial veil. From H. albidus it is readily distinguished by the veil and more robust stature.

Kuehneromyces mutabilis (Fr.) S. & S.; (Singer & Smith 1936). In a hardwood forest west of Mackinaw City, July 26, 1949, (Smith 32711). This is a common species in the Northwest and has been found in Nova Scotia, but for some reason appears to be rare in Michigan. It is one of the species we looked for at Tahquamenon but did not find.

Laccaria trullisata (Ellis) Peck. Abundant material of this well known and characteristic sand-dune fungus was found among the dunes west of Whitefish Point, Sept. 7-9, 1951, by Leathers and Smith, Nos. 38413 and 38574. As one would expect, this fungus is abundant in its restricted habitat during wet seasons.

Lactarius mucidus Burlingham (1908). The recorded specimens are from Billy's Creek, 7 miles east of Cheboygan, Aug. 8, 1951 (Edward A. Chmielewski 63); Carp Creek, below Iron Bridge, Douglas Lake, Aug. 10, 1951 (Harry Thiers 1251); Tahquamenon Falls State Park, Sept. 7, 1951 (Smith 38523), and Sept. 9 (38656). This well known fungus was described from the Pisgah Forest, North Carolina, and has since been found to be one of the common species of the Pacific Northwest. Hence its discovery in northern Michigan was not much of a surprise. It is not ordinarily collected in quantity but when fruiting well, can be found regularly.

Lactarius obnubilis (Lasch) Fries; (Burlingham, 1936). This common western species was found in a hemlock-birch forest near the upper falls, Tahquamenon Falls State Park, Sept. 5, 1949 (Stuntz & Smith 33392).

Lactarius varius Peck; (Burlingham, 1908). I have seen this species frequently in the state, but it is apparently unreported from the Lower Peninsula, and I failed to preserve my earlier collections. The one reported here is from Rees' Bog, at the north end of Burt Lake, Aug. 30, 1946 (Smith 23510).

Leucopaxillus amarus (A. & S) Kühner, f. amarus Singer & Smith (1943). This form was scattered under hemlock at Tahquamenon Falls State Park, Aug. 23, 1951 (Smith 38139), and Sept. 7, (Smith 38513). Its spores measure 4-6 x 3.5-5$\mu$. In the two collections cited here they regularly measure 5-5.5 x 4-5$\mu$. It is possible that this character is better than the degree of pigmentation (see Singer and Smith, l. c.) for the recognition of this form. In the other forms the spores are narrower or if of equal width, longer, so that one gets the impression, when viewing large numbers, that the spores are typically elliptic in face view rather than globose to subglobose.

Leucopaxillus candidus (Bres.) Singer; (Singer & Smith, 1943). This fungus occurred in a mixed forest, Tahquamenon Falls State Park, Sept. 5, 1949 (Smith 33342) and Aug. 23, 1951 (Smith 38201). The large specimen of the 1951 collection was too far gone to be preserved, but even it was not discolored to the degree characteristic of L. giganteus.

Mycena amicta (Fr.) Quélet. Morten Lange (no. 1043) collected this fungus in Rees' Bog, north shore of Burt Lake, July 3, 1947. It is the first record for the state. It is curious that this fungus, so abundant on conifer debris in the Pacific Northwest, should be so rare in the Great Lakes Region. I have been looking for it here in Michigan for more than twenty years, and this one record is the only one known to me. The collection consisted of two fruiting bodies.

Mycena glaopus (Fr.) Kummer. Smith (1947) commented on the failure of mycologists to record this species from Michigan. During the season of 1947 it was found sparingly in the vicinity of the Biological Station and at Cross Village, under hemlock in both instances, by Morten Lange and myself (Smith 25751 and 26168). It is difficult to understand why this is not common here as the habitats are favorable, as is the combination of temperature and precipitation. It is frequently found in quantity under hemlock in the Northwest.

Mycena strobilinoides Peck. This Mycena was originally reported from Michigan from one collection by E. B. Mains near Marquette. During the seasons of 1949 and 1951, it was observed under Pinus Banksiana at Tahquamenon State Park. On September 15, 1950 it was collected by Thiers and Smith (Smith 35831) again under P. Banksiana near Higgins Lake, and on Sept. 22 under P. resinosa near Douglas Lake. So far it appears that this species is limited to habitats dominated by 2-needle pines here in the Great Lakes Region, but in the Pacific Northwest its habitat range is more varied. In the Olympics and Cascades it is the characteristic late summer Mycena.

Mycena tenax Smith (1947). This species, common on the Pacific Coast, and known from Ontario, Nova Scotia and New York, has not previously been reported from Michigan. It was found under cedar and hemlock on the east side of Burt Lake, September 20, 1950 by Thiers and Smith (Smith 36031).

Mycena tenuiceps Smith (1947). This is the first report for this species since it was described from the Great Smoky Mts. National Park. It was found on hardwood logs, Tahquamenon Falls State Park, Sept. 5, 1949 (Smith 33383); July 2, 1951 (Smith 36625), and in the hardwoods south of Cross Village, Emmet County, also on hardwood logs, July 6, 1951 (Smith 36694). The spores in the Michigan collections measure 7-9 (10) x 5$\mu$ as contrasted with 6-8 $\mu$ long in the type. The long flexuous chelocystidia are an additional distinguishing feature to those already discussed (Smith, l.c.).

Pholiota squarrosa (Fr.) Kummer; (Smith, 1950). Clustered on the roots of an uprooted hemlock stump at Tahquamenon Falls State Park, Aug. 28, 1951 (Smith 38316). This collection had a strong onion-like odor. Since the carpophores were young and developing rapidly the odor could not have been caused by any type of deterioration.

Tricholoma pardinum Quélet; (Smith, 1944). The specimens were obtained in the Mackinaw City Hardwoods, Aug. 31, 1951 (Smith 28372) in an area where there was considerable hemlock. In regard to the microscopic characters, clavate to mucronate cheilocystidia 30-46 x 10-16$\mu$ were abundant on the gill edges. Since these had not been observed previously on the specimens reported (Smith 1944) for the Pacific Northwest, some of the cited collections in the former report (Smith 17541 in particular) were restudied. Cheilocystidia were found more or less buried in the gill edge. They measure 28-36 x 10-15$\mu$; and differ from those in Smith 28372 in having less pedicel. This hardly appears to be a valuable distinction.

Tricholompsis sulfuroides (Pk.) Singer. Pileus 2-7 cm. broad, convex with an inrolled margin, expanding to umbonate with a spreading margin, surface moist and variegated, slightly fibrillose to minutely scaly but glabrescent and finally smooth or nearly so; flesh thin and soft, odor and taste not recorded; lamellae broadly adnate to subdecurrent or becoming emarginate and rounded behind, close, rather broad, sulfur-yellow to yellowish, white-floccose on edges when young; stipe 3-8 cm. long, 5-7 mm. thick, of equal diameter throughout or at the base slightly enlarged, variously curved, central or eccentric, fibrillose, stuffed, becoming hollow, pale yellow, apex floccose.

Spores white in deposit, 6.5-8 x 5-5.5$\mu$, broadly ellipsoid, smooth, yellowish in Melzer's solution; basidia four-spored, 32-44 x 8-9$\mu$, clavate on slender pedicels; pleurocystidia present but imbedded, basidium-like but with flexuous walls, 30-40 x 6-7$\mu$, when mounted in Melzer's solution the hymenium is seen to have "pseudoamyloid" spotlike areas (made up of groups of cells which give a darker reaction in iodine than do the basidia; the flexuous cells here considered as pleurocystidia occur in these areas); cheilocystidia very abundant, 40-90 x 10-25$\mu$, clavate, subfusoid or irregular in shape, not reviving well and yellow to rusty ochraceous in KOH; gill trama parallel or nearly so, hyaline in KOH; pileus trama with a compact yellow-brown nongelatinous cuticle; some free hyphal ends projecting but no well differentiated pilocystidia seen; trama proper pallid, with laticiferous hyphae; clamp connections regularly present.

Habit, habitat and distribution: Gregarious on hemlock. Not infrequent in the northern part of the state, late summer and fall.

Observations. This species is very closely related to T. decorosum and T. flavescens, and is completely out of place in Pleurotus where it has been placed in the past. In fact this group has a number of additional taxa in it in North America and in the near future I plan to

publish an account of the genus. The genus is a logical one in anyone's system of classification because it brings closely related taxa together in such a way that the relationships are obvious. In the Friesian system, where these species were scattered in Pleurotus, Tricholoma, Clitocybe and Collybia, their relationships were obscured, and at the same time they did not fit in logically with the other species of these genera.

Volvaria bombycina (Fr.) Kummer. This well known species appears to be rare in Michigan so its occurrence in the Douglas Lake Region is worth recording. The first collection was from a maple log, Wolf Bog Area, July 18, 1947 (Smith 25799) and the second was made at the base of a maple tree in the hardwoods on the hills west of Pellston, Aug. 19, 1951 (Smith 37892). The material of no. 25799 was actually discovered by Professor Hungerford who was out with his Entomology class at the time and who later directed me to the log. The second collection represents the only time I have ever discovered fresh specimens without the help of other people.

However, the species has been collected on shade trees right in Ann Arbor, and there is actually an interesting story connected with its occurrence there. It seems that about a year before our entrance into World War I, some members of a family in Ann Arbor were poisoned and died as a result of eating an Amanita. The next year Volvaria bombycina fruited on a maple tree at the home of this family, and the story was soon circulated that spores of the poisonous species had escaped from the house the year before, lodged in the tree and grew — and now here were the fruiting bodies. You can imagine how the neighbors stood in awe of these specimens, and how the fruiting bodies soon became known as "ghost mushrooms". I am certain no one in the vicinity had any thought of eating them. V. bombycina, of course, is rated as a good edible species and is easily separated from any Amanita by the color of the spore deposit.

The recent discovery of Paul Kummer's "Führer in die Pilzkunde," published in 1871, in which the tribes of Fries are recognized as genera, has led to the changing of the authorities of many of our well known species, such as this one.

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# A REVIEW OF PRESCOTT'S "ALGAE OF THE WESTERN GREAT LAKES AREA"

John L. Blum

DR. PRESCOTT has prepared an excellent and useful compendium of our knowledge of the algae of Michigan and Wisconsin, circumscribed of necessity to exclude the numerous desmid and diatom species.* The work is based upon the author's long personal experience in these states as well as upon the several score of other contributions to the algae of this region by many different workers in the field.

The first portion of the book (46 pp.) is devoted to ecological considerations: "Geological Features and Algal Distribution" and "Relationships of Phytoplankton to Lake Productivity". These sections are illustrated with several text figures and tables and represent a valuable summary of certain aspects of the ecology of freshwater algae in America.

The major portion of the work is a flora of the areas and algal groups considered. Each species, and also its varietal and other entities, is described, and the great majority are illustrated in the 136 plates. Many series of illustrations run the gamut of entire genera, bringing together visually material that has been available heretofore only in scattered publications. Especially notable is a series of illustrations of the euglenoid flagellates. In addition to the specific descriptions there are keys to the species of every genus which has two or more species reported from the area, as well as keys to the families and to the genera of each family. In the construction of the keys and in the studied architecture of the various sections of the book, the author exhibits to a marked degree concern and consideration for the users of his work: thus the index lists, after each species, first the page upon which the description appears; then, "also . . ." followed by other less important references to the species, and the number of the plate. Further, plate legends are to be found facing the corresponding plates; figures in plates are numbered consistently from left to right and from top to bottom, so that no time need be lost in searching for figures. These refinements will make it a pleasure to employ the book in routine work. There is a glossary of fourteen pages and, in addition, thirteen pages of "morphological terms illustrated", which would prove a valued adjunct to virtually any of the larger works on freshwater algae. The taxonomic section is followed by a compendious bibliography of 50 pages.

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*ALGAE OF THE WESTERN GREAT LAKES AREA EXCLUSIVE OF DESMIDS AND DIATOMS. By G. W. Prescott. Cranbrook Institute of Science, Bloomfield Hills, Michigan. Bulletin 31. 1951. xiii + 946 pp. Pl. 1-136. (Price, $10.00).

American students of the freshwater algae will find in Professor Prescott's book a most useful manual, probably the most useful of any equally inclusive manual. Although a regional flora it will have utility throughout the larger portion of North America.

Users may be handicapped by the fact that the illustrations, like those of nearly every large work on freshwater algae, do not show sufficient range of variation within a single species to enable the student pigeonhole every aberrant individual collection. For the non-specialist, the determination of most groups of the freshwater algae remains no foolproof undertaking, even with such an excellent work as this in hand. The fact is that even the specialist may have no more than a nodding acquaintance with many of the species here described. Closer familiarity is literally impossible of achievement under the conditions of observation which many of the algae offer. Until we have gained a background by decades of collecting by many active workers (such as has been attained, for example, for the vascular plant flora of parts of the Eastern United States) we cannot hope to arrive at a full and rounded understanding of the numerous algal species. Dr. Prescott's volume, therefore, must be recognized as a great step forward in the exploration of a vast and imperfectly known segment of the American biota. It is unquestionably the most useful American treatise on the freshwater algae which is likely to be available for some time to come, and it is greatly to be hoped that it will be followed by a similar work on the desmids and the diatoms.

---

NEWS FROM DR. CLOVER IN THE FIELD. — On page 143 we promised to give more late news from the University's traveling field course in botany, which has been making its way toward the southwestern United States. Through the kindness of Dr. Pierre Dansereau we present the following report on the first week of the expedition's progress. Dr. Clover's letter to Dr. Dansereau is from Stillwater, Oklahoma, dated June 30:

"Dear Pierre:

We have finished studying the Prairie. Spent one day collecting and making quadrat studies. A half day in oaks and canyon adjacent and a half day with Drs. Hanson and Waterfall [of Oklahoma A. & M. College] on Chapman & Barnard Ranch and touring to other ranches. Now we are studying in herbarium at Stillwater & living luxuriously in a dormitory. Hot as Hades!

Elzada.

[P.S.] We are all well, very dark, happy. Will study Edwards Plateau near Austin for 3 days.

# NEWS FROM MEMBERS OF THE MICHIGAN BOTANICAL GARDENS ASSOCIATION

Greetings from James Kucyniak*

Ville de Montréal

City of Montreal, Quebec

Canada

4101 Est, Rue Sherbrooke
January 10, 1952

Le Jardin Botanique de Montréal
Montreal Botanical Garden

Dear Uncle Harley:

Many thanks for your notice regarding the Michigan Botanical Gardens Association. The enclosed form and money will let you know how heartily I am in favor of all you have done and plan to do for the Gardens.

I have shown your letter to Dr. Jacques Rousseau, our Director. I am authorized on his behalf to say that he is keenly enthusiastic about your proposals and has expressed the desire to receive a circular which will enable him to vouch his support for the new enterprise. Moreover, he has been good enough to suggest you send one also to Dr. Muriel Roscoe, Chairman, Department of Botany, McGill University, Montreal, a person of great charm and initiative, whom through pleasant association we know to be highly in favor of progressive enterprise on the part of botanical gardens.

Wishing you all success in the projects outlined, I remain,

Yours ever cordially and gratefully,
Jim Kucyniak

---

*Mr. Kucyniak has been a close associate in affairs of the Botanical Gardens at Ann Arbor. He was a member of our 1948 expedition to Port Radium, Great Bear Lake, for the study of botanical conditions on an area of high natural radioactivity. He made an extensive seed collection on that trip which was offered to other Gardens in exchange through the 1949 seed list of the Montreal Botanic Garden. Our group consisted of Dr. W. C. Steere, Bryologist and Chief of Party; Dr. Robert J. Lowry, Cytologist; Dr. Edwin A. Phillips, Ecologist; Hansford T. Shacklette, Phanerogamic Botanist; and Mr. James T. Kucyniak, Botanist in charge of seed collecting. The Port Radium expedition was undertaken with the support of the Office of Naval Research, U. S. Navy. — H. H. B.

EDITORIAL NOTES. The list of subscribers to the Asa Gray Bulletin, with indication of affiliation (if any) of each subscriber with one or both of the two supporting groups, is being deferred to a later issue, although promised for the present one. Now that the subscription price has been set at $3.25 for Vol. I (four numbers) and $3.00 per volume for subsequent volumes of four numbers each, we hope that our list will shortly become reasonably stabilized so that it can be published in Vol. I No. 4. Needless to say, we cannot continue to publish on the present scale with the fluctuating support of only about a hundred subscribers. If those who are in position to do so will secure institutional subscriptions to the Bulletin, and all will try to find an additional individual subscriber each, it will go far toward insuring continuation beyond Vol. I without too great shrinkage in size. We do not want to drum up individual subscribers who are not interested in one or more of our objectives, but we do hope for the support of about three or four hundred who are. We should reasonably expect to get an average of five or six subscribers in each state except Michigan, and a hundred and fifty or more in Michigan, since we shall specialize at first on assembling materials for a new Flora of Michigan.

EDITORIAL NOTES. Since one of the chief objectives of our Bulletin is to commemorate the life and works of Asa Gray, it will be a matter of editorial policy to include appropriate articles about him whenever they become available. One such was written last year by Professor Robert Taft of the Department of Chemistry, University of Kansas, and Editor of the Transactions of the Kansas Academy of Science. Entitled "Asa Gray's Ascent of Gray's Peak," it was published as an editorial in the Transactions of that Academy for March, 1951, and may not have been seen by most of our readers. It is therefore reprinted here with the kind permission of Professor Taft.

Vol. I, No. 1 of the Asa Gray Bulletin, for January, was actually published 4 March. It contained nothing for which the actual date of publication was of any importance, but we shall follow the policy of noting in each number the date on which the preceding one was mailed to at least twenty-five botanical institutions and libraries.

## FORECAST FOR THE NEXT TWO ISSUES

THE beginning of a series of letters on botanical and ornithological work in India, by Dr. Walter Koelz, whose most recent work has been in Nepal and Assam;

An article on a botanical mission to Okinawa, by Dr. Egbert H. Walker;

Observations on the bull thistle in Michigan, by Clarence R. Hanes;

Botanical news from the Philippines;

Glimpses of the natural history of Koror, Palau Islands, by Peter J. and Alma Hill;

Continuation of correspondence on oaks;

"The Wood Collectors' Society: its objectives and activities", by Jeannette M. Kryn;

Classified lists of members of the supporting associations, and other subscribers;

A communication from the Permanent Secretary regarding the election of officers and the proposed reorganization of the Gray Memorial Botanical Association;

Correspondence and an article on popcorn by Volney M. Jones and others;

Another article on the Oriente of Cuba, by Grady Webster and Roy N. Jervis;

Observations of a forest pathologist in Alaska, by Dow V. Baxter;

Botanical description of the Haven Hill Tract, Oakland County, Michigan: Part of a field reconnaissance report to the Michigan Natural Areas Council, by Paul W. Thompson;

A proposal for a postage stamp commemorating Asa Gray, by H. H. Bartlett;

A paleobotanical excursion in northern Alaska, by Chester A. Arnold;

The collection and preservation of ascomycetous fungi, by Lewis E. Wehmeyer;

The vegetation of Ullung Do, Korea, by In-Cho Chung;

A trip to a seldom-visited part of the Grand Canyon of the Colorado, by Elizabeth McClintock.

THE ASA GRAY BULLETIN, NEW SERIES. — An occasional publication devoted to more or less informal communication among the members of the Gray Memorial Botanical Association and the Michigan Botanical Gardens Association. Appropriate contributions from members of either group or from subscribers will be accepted. For the present, progress reports of current field, garden, and herbarium work, with readable and relatively non-technical articles in the fields related to systematics, botanical history, biography, and bibliography, will be preferred. There will be special emphasis upon preparatory work for a new "Flora of Michigan". Free use will be made of letters to the Editors (if released for publication by their writers) and of current news notes regarding botanists.

Items for publication should be addressed to either of the Editors at the Department of Botany, University of Michigan, Ann Arbor, Michigan. Contributors may secure reprints of their articles.

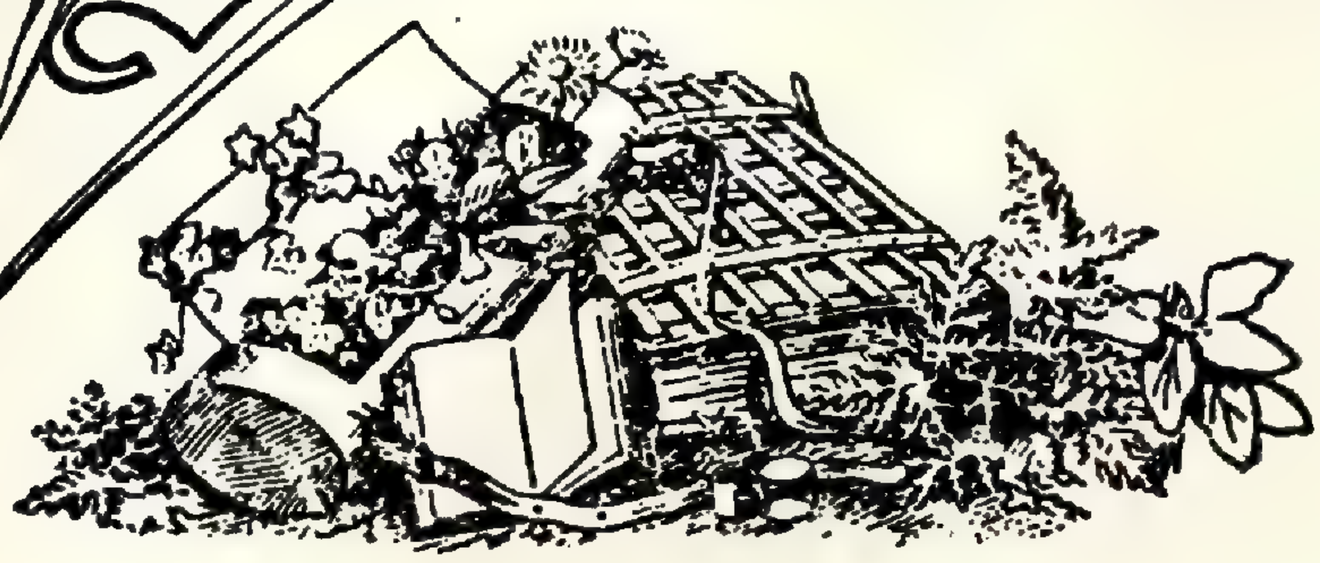
Address subscriptions to Dr. Ruth B. McVaugh, Business Manager, 403 Arbana Drive, Ann Arbor, Michigan. Subscription price for Volume I is $3.25 ($1.00 for Vol. I, No. 1 separately, other numbers $0.75 each).

THE GRAY MEMORIAL BOTANICAL ASSOCIATION, FOUNDED 1887. — This organization sponsored publication of early volumes of the Asa Gray Bulletin. Later it issued a mimeographed "Bulletin". Its object is to commemorate the life and botanical work of Asa Gray and to assist its members in botanical activity by furthering friendly correspondence and cooperation among them. Interested persons are invited to communicate with the Permanent Secretary, Professor R. Lee Walp, Building 305, Apt. 1, Stanford Village, California.

MICHIGAN BOTANICAL GARDENS ASSOCIATION. — Founded in 1925 to include persons interested in promoting the development and current activities of the Botanical Gardens of the University of Michigan. There are no dues, but subscription to the Asa Gray Bulletin is invited. For further information, communicate with Dr. Frieda Cobb Blanchard, Secretary, 2014 Geddes Avenue, Ann Arbor, Michigan.

N.S. Vol. I July, 1952 No. 3

# The Gray Herbarium Bulletin



*Edited and published for*

**THE GRAY MEMORIAL BOTANICAL ASSOCIATION**
**and the**
**BOTANICAL GARDENS ASSOCIATION**
**OF THE UNIVERSITY OF MICHIGAN**
**by**
***Harley H. Bartlett and Rogers McVaugh***

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ANN ARBOR, MICHIGAN

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## EDITORIAL NOTICE TO SUBSCRIBERS

Publication of Vol. I of the Asa Gray Bulletin will be completed, it is expected, during December, 1952. No. 3, carrying this notice, will be followed by No. 4, with index to Vol. I, as soon as the response to a communication which is being addressed to present and prospective subscribers seems reasonably complete. No. 4 is to contain a list of the subscribers as of the date of going to press, presumably about the middle of December, indicating membership in the sponsoring organizations. This is an unusual feature for any magazine, and one which might ordinarily be considered quite useless. The Asa Gray Bulletin, however, is informal in nature, and intended largely as a substitute for private correspondence of more than individual interest. The botanical letters and news notes, to be used as freely as correspondents release them for publication, as well as the semi-popular articles, are of sufficiently personal interest so that the contributors wish to know exactly for whom they are writing. The roster of subscribers to be published in No. 4 will not be repeated until obsolete, but will be supplemented from time to time by listing the names of new subscribers only.

# ARCTIC TWILIGHT

Dow V. Baxter

ALL conservationists do not direct their efforts solely toward preventing man from burning up or cutting over forests. Robert Marshall, for instance, wanted, with reason, to set aside much of the Alaska country north of the Yukon, tundra and all, for a wilderness area. It was of the "Arctic Village" of Wiseman, that he states, "The people of the Koyukuk have made for themselves the happiest civilization of which I have knowledge." Such civilizations in these days are worth preserving.

In the country about Wiseman, a little clump of cabins about 200 air miles north of Fairbanks' parking meters and paved streets, timber has been almost as important to the gold diggers as food. The scattered spruce timber grows slowly in the valleys and on the lower slopes south of the barren rocky summits. It has served for both shelter and fuel. It takes lots of wood to fight the 80° (F.) below zero temperatures during the winter, and it should not be wasted. Many of my collections of Arctic fungi, however, have been made in the areas of fire-killed black spruce muskegs in the Koyukuk drainage system, that is bigger than some European countries.

In 1949 Tom Miller (my assistant from Ann Arbor) and I, were flying over some of this smoking muskeg toward Wiseman to study the fungi that attack trees in the Arctic, just as Bob Marshall had come into this country to study trees. Our Cessna was loaded down with heavy equipment and supplies for Bettles and Wiseman, both of the Koyukuk drainage. Our own duffle included food, cameras, a plant press, mosquito nets, and cooking equipment.

As we flew north of the Yukon River, my thoughts turned from wondering how long the fires had been burning, to recalling accounts of the country beneath as told by Bob. The hills below began to fit into Bob's description of the Koyukuk country in his "Arctic Village", the "best seller" of the north country since Robert Service's stampede tales about "the spell of the Yukon". Here below us lived the amiable and frank characters with whom Bob hiked over miles of country, as well as those that were equally competent in fields not involving much physical exertion. These very people were about to step out of the pages of "Arctic Village". Never before have I approached a settlement or a city for the first time with the feeling that I knew the strangers living there. There were those that had liked Bob and the things he did. Albert Ness, a modern, but old philosopher, was one of them. Others had been tamed later by the passing years and perhaps by the royalties Bob presented to the citizens of Wiseman. Some, not

mentioned in "Arctic Village", might seem still a little disgruntled.

As our plane slid down to the landing strip, I could see an old man with khaki-suspendered pants, a girl who turned out to be Bob's highly intelligent Florence Ulen, the daughter of a white father and Eskimo mother, and a lean tall man with black whiskers and features that looked like those of Abraham Lincoln.

'It's Louis", I hollered. It was Louis H. Jordal of the University's Botanical Garden and one of the very best authorities on this side of the Atlantic when it came to knowing the vegetation of the North.

When our duffle was unloaded from the Cessna, Louie informed me that there was room in his cabin for the Michigan party, where I could mix my few words of Swedish with his natural Norwegian. Already Wiseman hospitality was in full swing for the Sunday afternoon. Even before our duffle had been more than dumped outside Louie's door, we had accepted an invitation to help Florence stretch the salmon net across the North Fork of the cold Koyukuk, and then with our suspendered friend, Nelson of Wiseman, to call upon all the residents of Arctic Village.

There was old Kobak Mary, the Eskimo who had a high reputation in the finesse of gambling, sold canned goods from her parlor shelf, and rocked in a heavy leather chair. She liked music. Kobak Mary, the postmaster, his Eskimo wife, the Jonas family (Eskimo), and Albert Ness were on our calling list. Nelson, the undertaker, professionalized because he could build boxes, was our suspendered guide to Arctic Village that afternoon, and one who turned out to be a frequent visitor to Louie's all during our stay in Wiseman. Visiting was to be diverted long enough for a tour through the brushy cemetery. Louie Jordal, already a citizen of Wiseman, would join us and depart again, off and on for the next twelve hours.

After learning about some of the people, now gone from Wiseman, we, with Blacky, the dog that practically starved while staying with his master's body until Nelson found the two in a cabin some few miles away, went to Albert Ness's place. Louie had joined us in the meantime. Mr. Ness's front yard was neatly gardened with blooming potatoes, lots of onions, lettuce, radishes, rhubarb, and a few attractive marigolds.

"Come in", Ness replied to the knock at his door.

As we entered, Ness reached over from his bed, scratched a match, and lighted some smudge powder to smoke down the mosquitoes in the room.

As the old man lay there in bed, he talked about world events and expressed a deep interest in who might replace Judge Murphy on the Supreme Court. From his discussion of a whole panel of possible

replacements that might be made, he switched to the subject of plant culture. He inquired, also, about the name of one of the plants growing in his window filled mostly with geraniums and begonias. I think Louie told him that it was one of the tobaccos, an answer that obviously pleased the old gentleman, since he had apparently made many previous inquiries as to its identity.

From his intelligent discussion of floriculture and gardening, we passed to inquiries about Wiseman. I looked forward to many visits with Albert during our stay and hoped that this first lengthy call would not be tiring for the old gentleman. He brought back the past in his recollections.

"Prospecting — that's what brought us here! Nolan Creek was once packed with activity, but the richest claims have been mined." "Today", he said, "The young men don't look for gold, they can make more by working on the highway or driving a truck for the government".

"It's not the successes, Professor Baxter, that you're going to see here in Wiseman. They're all gone. It's the failures who stay on, and live in Wiseman".

I was sorry that there had to be a conclusion to his stories but as the smudge was dying out, it seemed time for us to be locating ourselves. Louie, too, agreed we should see about moving in and getting some supper cooked.

Outside Ness's place, I asked Louie what ailed our old friend, there in bed.

"Nothing", Louie snapped.

"Nothing?" I said, "Well, what put him to bed?"

"Do you know what time it is?" asked Louie, knowing full well that I didn't, as he looked at his watch. "It is exactly midnight". Our philosopher had apparently figured that calling hours were over. I was impressed all the more by his good sense. That's some of the brand of wisdom this wilderness breeds, I thought.

We could see our duffle from a distance, including camera equipment that I would not dare to leave unlocked in Ann Arbor, outside Louie's place where we left it in the fireweeds some twelve hours previously. Louie's cabin was made of logs chinked with sphagnum moss. There was a board floor of whip-sawed spruce. Unlike many of the cabins in Wiseman, the log roof was covered with tin instead of sod. There was sort of a vestibule or cache on the outside "front" made of planks and covered mostly with tar paper, where Louie kept the neatly stacked firewood that he had sawed sometime between strenuous collecting trips.

In spite of the long day, the cabin was reasonably dark inside, so

Louie pumped the gasoline light to a glow, started a fire, peeled some expensive spuds, and started to get supper while Tom and I moved in. Our first visitor, Mr. Nelson, called, but since he had already eaten, he preferred to talk and tell us a story that had something to do with an Eskimo woman, but I was too tired and too interested in food to follow through to the punch line.

Louie was anything but a late sleeper in Wiseman, so regardless of having turned in shortly before, he was up at six-thirty trying to light the fire. Determined not to let the genial botanist get the best of us, Tom and I rushed out to clear the table for morning coffee. It served as a desk, catch-all for specimens, and breakfast nook.

Dawn doesn't come to Wiseman at this season. It's on hand when you get up. The morning light, though, gave me a better chance to look at the stacks of specimens Louie had studied. If a species had bloomed here, it was represented by specimens in the cabin. They came from everywhere between niggerhead flats and taiga-tundra to almost any one of the mountain summits about. To airlift these to the outside was going to be costly. Already Louie had spent much of his own money in buying and bringing in supplies — and air freight isn't any cheaper here for botany students than it is for miners.

Luckily for me, Louie suggested that we work near Wiseman this first day in the field. We would collect chiefly in a nearby spruce muskeg so I could agree or disagree on the identity of the spruce he had been calling Picea glauca Albertiana. This is the spruce with the slender spire-like appearance and is actually the dominant tree in the region, where it ascends to about 3000 feet. Now at home in Michigan distinguishing the spruces is not considered difficult, but in Wiseman both Louie and I suspect that there is a lot of introgression between the white and black species, and for that matter I have the same view with reference to trees southward in the Kenai, in Cook Inlet districts, where white and Sitka become problematically distinct. We definitely settled, however, on the form Albertiana for this tree.

As we slogged along through the dwarf birch here (Betula glandulosa) Louie commented that, "one of these characters here in Wiseman, and a good observer too, tells me these lowland spruces show a preponderant tendency to a dextral twist, but he says the reverse is true for the trees at higher altitudes". He added: "I haven't had time to check on that yet".

We stopped and looked at a number of trees and collected specimens of a resupinate polypore, my first find north of the polar circle on this trip. "You can identify this fungus that causes much decay in fire-killed spruce even if fruiting structures are inadequate", I pointed out. "Wood rotted by Trametes variiformis has a dry pungent odor all its own".

Louie was always very much of a conversationalist on his trips and there seemed to be no end to his interest in things taxonomic and phytogeographic. As we stood there in this Arctic land and looked at the sea of mountains about us, Louie said: "Apart from the obvious romantic appeal that a region as remote as the Brooks Range holds to any student of Arctic floras, the range offers unusual promise for one to search for relict plant populations".

It was clearly evident that Louie had found the plants about Arctic Village to be as fascinating in their way as Bob Marshall had found the people.

"Ya", Louie kept on talking as we attempted an arduous two miles over, around, and through some flat tussock country, "this Brooks Range, you know, stands as a potential connecting link between the floras of the partly glaciated and unglaciated regions of northeastern Asia and northwestern America during Pleistocene times".

We had climbed a little by this time and had stopped for some raisins and dried peaches with marvelous cold water to drink near a little trickling stream. Louie was still talking about the Brooks Range, but I had already been impressed long ago by Louie's knowledge of it and his eagerness to know more about plants from all over these mountains. A collector could not, however, come to appreciate Louie's accomplishments and the work he loved until indoctrinated by tramping with him. One soon came to realize that the Brooks Range just isn't one range, that debouches into a plain, but that here we have a whole group of ranges "en echelon" which form the watershed between the Yukon and the Arctic Ocean, and that any one of them might conceal surprises for the botanist.

"Look around at the mountains that fill the horizon," Louie would say. "A fellow cannot fail to be impressed with the fact that many of the peaks from whatever point of lookout, were never ice covered at any stage in their history. This Interior Alaska is the grandest boreal refugium in North America".

Louie told us that he had been pleasantly surprised time and time again during his botanizing in these mountains to stumble on plants never seen before in the area. "In spite of persistent searches", he said, "there are some plants here that have not been found in other localities".

Back in the cabin that night, and after a good supper with free lettuce from our neighbor's patch, I was glad to see Nelson and Blackie come in. All but Blackie had coffee. I was tired, but we had an interesting evening.

The next morning, immediately after breakfast, I went over to Kobak Mary's to buy a can of pears from her shelf so we could have pears and coffee. When Nelson showed up that evening we would celebrate.

Louie and Tom were all ready for the field when I got back. I planned to work in some of the muskeg timber that day, but my colleagues were going miles farther on and above timber to look for certain plants on the Paleozoic schists between Wiseman and Nolan, the old placer mine country. Louie said they would be late, so I planned to have supper ready when they returned.

Before leaving Wiseman, however, Louie wanted to obtain specimens of an albino fireweed that he called Epilobium angustifolium f. albiflorum. Although the tall rank pink fireweed is so common that it splashes color into almost any spot about town, this is a pure white form that inhabits mine tailing dumps, garden patches, or bare earth about old cabins. We got lots of specimens of these attractive white-bloomed stalks and I took moving pictures of Louie preparing them for press. My own prize was a resupinate specimen of Trametes serialis, a species which commonly causes decay in cabins in the Arctic. In fact, this species together with one collected earlier the same morning, Poria xantha, are the two polypores that are characteristic of the higher fungus flora in the region.

While we were taking pictures of the white fireweed, Louie demonstrated the soil temperature by sticking his guage into the soil. I photographed the needle as it moved around the dial to zero. Permafrost and flowers seem paradoxical.

I think it was Albert Ness who had informed Louie that such white-flowered plants do not reproduce themselves (clonally) in any vigorous way. I believe he had tested the seed, too, of these relatively rare plants, but found them also apparently inviable. These plants we photographed were as thrifty as the abundant red ones about Arctic Village.

I returned to the cabin about seven that night and did a hurried job of peeling the watery home-grown potatoes and getting supper so that everything would be ready for the boys when they came back from the mountain. There was plenty of time, however, since it must have been almost nine when Nelson dropped in, and no Louie or Tom. Nelson and I ate some pears and had some coffee. "If they went where I think they did", Nelson commented, "it's a good seventeen hour trek. We make it in two days, the few of us who have done it."

After Nelson left, I jotted down a few notes about the day's crop of fungi and then entertained myself by looking over some of Louie's specimens before turning in. The morning faintly greenish light sky that came through the window was marvelous, and if the boys were not worn out, I knew they were having a wonderful time. Louie loved it and so did we all.

When they finally did return we all had "supper". No, they hadn't gone where Nelson thought, but they must have been up high since they

## Arctic Twilight: A Visit with Louis Jordal

Top: Approach to "Arctic Village." Photograph by Dow V. Baxter.

Below: Louis Jordal at his cabin in Wiseman. Photograph by Dow V. Baxter.

were both excited over three surprised mountain sheep that raced down almost in front of them.

It was a late breakfast we had the next day, but it isn't necessary to follow the clock when there are so many light working hours. Elsewhere, one sits around a fire at night or in a cabin, and if there is anything to discuss, that seems to be the time for it. In Wiseman one can work so late at night that the "morning breakfast", whenever that comes, is just as good a period for philosophizing as any other.

Louie liked to talk and as he was personally familiar with northern Norway and Sweden, we liked to compare notes on northern vegetation whenever our experiences overlapped. He always referred to my ideas regarding the "notable" absence of a subalpine deciduous zone in North America as an "intriguing hypothesis". Although I would use slightly different words to express this, Louie's own account is partly a carry-over from this morning's breakfast hour. He would say: "The selective choice for the occupancy of the subalpine zone in Scandinavia was restricted to only two coniferous species, viz. Picea excelsa and Pinus sylvestris". A birch, Betula tortuosa, proved particularly adapted to this situation," and hence has come to occupy it throughout the Scandinavian mountain regions. In America, on the contrary, the conifers are represented by a much larger number of species, and in Alaska-Yukon the white spruce, Picea glauca, in the absence of serious competition from the deciduous trees, occupies a large part of the subalpine regions which in Scandinavia are occupied by Betula tortuosa. Farther to the south in the Rocky Mountain system, other conifers replace Picea glauca as tree-line species."

The last time I saw Louie in Alaska, we were flying together towards Bettles in a Sea Bee. I don't like Sea Bees. Although I have flown in all sorts of craft in Alaska and under all sorts of conditions — such as the time we landed some miles outside of Kotzebue without a field beneath us, or when we were over in the Newhalen country and the fusilage caught on fire just as we were loading our duffle — I don't seem to mind anything but a Sea Bee. In a Sea Bee, I have the feeling that either the craft will fall apart or I will fall out. Louie, though, was enjoying our flight immensely. He was looking especially for water lilies in the little lakes we were passing. He had a special interest in them because they were index plants that indicated to him a special type of plant distribution in this part of Alaska. This life in the Arctic was his life, and he was living it intensely. Even when up in the clouds, he was interpreting the plant life all around from the swamps to the highest peak. In Wiseman, he worked hard and thought hard, and lived there as happily as any native could in Bob Marshall's "happiest civilization I ever saw". Louie left for us in his doctoral dissertation the most accurate and important account we have of Nature at Arctic Village.

# A PRELIMINARY ACCOUNT OF THE UNIVERSITY OF MICHIGAN ALEUTIAN EXPEDITIONS, 1950-51

T. P. Bank, II

IN 1948 and 1949 the University of Michigan sent two expeditions to the Aleutian Islands, which were aided by a grant from the Office of Naval Research, U. S. Navy Department. The Botanical Gardens and the Museum of Anthropology of the University of Michigan sponsored the program, which was under the general direction of Professor H. H. Bartlett.

Primarily, the 1948 and 1949 expeditions were concerned with botanical and anthropological surveys. Plant collections were assembled during explorations of 15 Aleutian islands from Unalaska to Attu. Phytoecological studies were carried out in all representative plant habitats. Ethnobotanical investigations consisted not only of interrogation of living Aleuts but also the collection of materials from archaeological excavations and burial caves. Members of the field parties located and mapped more than 60 old village sites by aerial reconnaissance. From all excavations, burial caves, and as many stratified exposures in stream and road cuts as could be visited, humus samples were collected for microscopic studies of the flora and fauna and for determination of carbon-14 content.

Members of the 1948 reconnaissance expedition included T. P. Bank, (Mrs.) J. F. Bank, and R. E. Dorsett. The Banks remained overwinter in Atka village to extend their ethnobotanical and ethnological studies among the Aleuts. The 1949 party consisted of Theodore P. Bank, field director; Janet F. Bank, assistant in anthropology; Albert C. Spaulding, archaeologist; Wesley R. Hurt, assistant in archaeology; Harvey A. Miller, botanist; Louis H. Jordal, botanist; and Captain Frederick B. Bown, USAF, military observer.

Results of aerial and ground surveys emphasized the need for further exploration of selected Aleutian village sites and especially the need for careful, stratigraphic excavation. Further development of the radio-carbon method of dating organic samples presented a strong reason for re-excavation of the archaeological sites of Dall, Jochelson, and Hrdlička. Plans were made for dating organic soil layers intercalated between volcanic ash deposits with a view of correlating recognizable events of volcanic activity with Aleut pre-history.

The 1949 expedition had stored equipment and rations at Adak, so it was decided that the 1950 party would have its base there. The Office of Naval Research aided by obtaining security clearance for the

expedition and Naval Technician status for the personnel. This status was necessary in order that the field party might have advantage of military transportation when routine operations afforded opportunity without any extra expense being involved. Many places in the Aleutians could only be reached by courtesy of the military authorities. In 1950 only minimal assistance was available through military cooperation, and the expedition was therefore forced to confine its activities to the Unalaska district.

The 1950 party flew by commercial air line from Seattle to Kodiak. At Kodiak they boarded the U. S. Coast Guard Cutter, Sweetbrier, for reconnaissance along the southern side of the Alaskan Peninsula to Unalaska and from this port to Adak. The Sweetbrier also transported the Michigan party to Tanaga Island where they were put ashore. Expedition personnel carried out botanical and archaeological investigations on Tanaga and were picked up nine days later on the southwestern side of the island by the cutter. In late August the party successfully completed a second ascent of Great Sitkin volcano (the first was in July of 1949) for the purpose of continuing phytoecological studies near the crater. During September and October, T. P. Bank revisited Atka and Nikolski villages to check certain ethnological data and to secure stratigraphic soil samples from selected sites.

The 1951 field party sailed from Seattle to Juneau on a commercial steamship to spend a week in research at the Territorial Museum and offices of the Alaska Native Service. Another week was spent on Kodiak island in archaeological reconnaissance. From Kodiak the Michigan group flew directly to Unalaska. A major excavation was undertaken at an old village site on Amaknak Island, and, in addition, test trenches were dug at other localities. Further archaeological reconnaissance revealed a number of hitherto unreported old village sites. Ethnological and ethnobiological studies were carried out in the village of Unalaska, where the expedition maintained its headquarters in the abandoned Alaska Native Service hospital building. Members of the two summer field parties included: Theodore P. Bank, field director (both years); Janet F. Bank, ethnological and administrative assistant (1951); Harvey A. Miller, botanist (1950); Donald S. McClain, archaeological assistant (1950); Jane E. Phillips, recorder and artist (1951); Ken K. Bay, field assistant (1951); Noel Wyatt, field assistant (1951); Walter N. Dyakanoff, Aleut interpreter (both years); Walter A. Weber, ornithologist (both years); Thayne C. Parks, invertebrate zoologist (both years).

The last-named members of the expedition conducted studies on Adak during off-duty hours from their Naval occupations.

## BOTANY

The flowering plants of the Aleutian flora are fairly well known. Knowledge of thallophyte and bryophyte floras, however, is still scanty,

as is information on the ecological aspects of Aleutian vegetation. Accordingly, botanical work of the two years, 1950 and 1951, resolved itself into three primary studies. Bryophytes were collected for critical study from varying habitat types, and ecological transects were examined closely at selected locations. A third objective, which was the most important from the standpoint of correlation with radio-carbon dating in the Aleutians, consisted of collection of soil from excavations, road cuts, stream banks and other exposures, soil for stratigraphic studies and microscopic identification of pollen, seeds, spores, and fauna. Careful records of stratigraphy were of course kept. (See Fig. 1.)

Glacier Creek valley on the slopes of active Great Sitkin volcano offered an interesting phytoecological study area. The Michigan party revisited the valley in 1950 to determine the amount of ice retreat during the preceding year and the advance of vegetation onto the newly ice-free areas, which were mostly above 3,000 feet. One transect was studied on an area adjacent to the terminal margin of the glacier. Map and photograph comparisons indicate that a number of plants had invaded during the past year. In the main, the primary invaders of newly ice-free zones are lichens and mosses, but Luzula arcuata, Agrostis exarata, Hieracium triste, Carex circinnata, and Sibbaldia procumbens were also found. (Hultén[1] had noted that in the Aleutians Agrostis exarata is usually found only close to human habitations.) Behind the newly ice-free belt on well drained gravel areas close to the ice banks were several species of Salix, individual groups of Campanula lasiocarpa, Carex macrochaeta, and an occasional clump of Lupinus nootkatensis. The ability of a number of Aleutian plants to invade new ground is remarkable. This is especially noticeable on earth slide scars of steep hillsides, and Hultén has made note of the quick invasion of Bogoslof, the recently formed Bering Sea island, by Senecio pseudoarnica and other plants.

H. A. Miller collected bryophytes and lichens from many habitats, primarily on Unimak, Unalaska, Adak, Great Sitkin, and Tanaga islands. Especially interesting were alpine and wind plane areas with their characteristic vegetation of lichens, mosses, Salix, Lycopodium, Tofieldia coccinea, Cassiope lycopodioides, Antennaria monocephala, and Loiseleuria procumbens. In all, the bryophyte and lichen collections consist of 680 numbers, which include ecological samplings of many species. About 120 vascular plants were collected, mostly high alpine species and plants of ethnobotanical importance. The soil samples are being investigated microscopically, and it is expected that several papers will be published from time to time on these studies. Other botanical reports are at present in manuscript form or in press awaiting publication.[2]

[1] Hultén, Eric. Flora of the Aleutian Islands, Stockholm, 1937.

[2] Bank, T. P., Aleutian vegetation and Aleut culture. Papers of the Michigan Academy of Science Arts and Letters. Ann Arbor (in press).

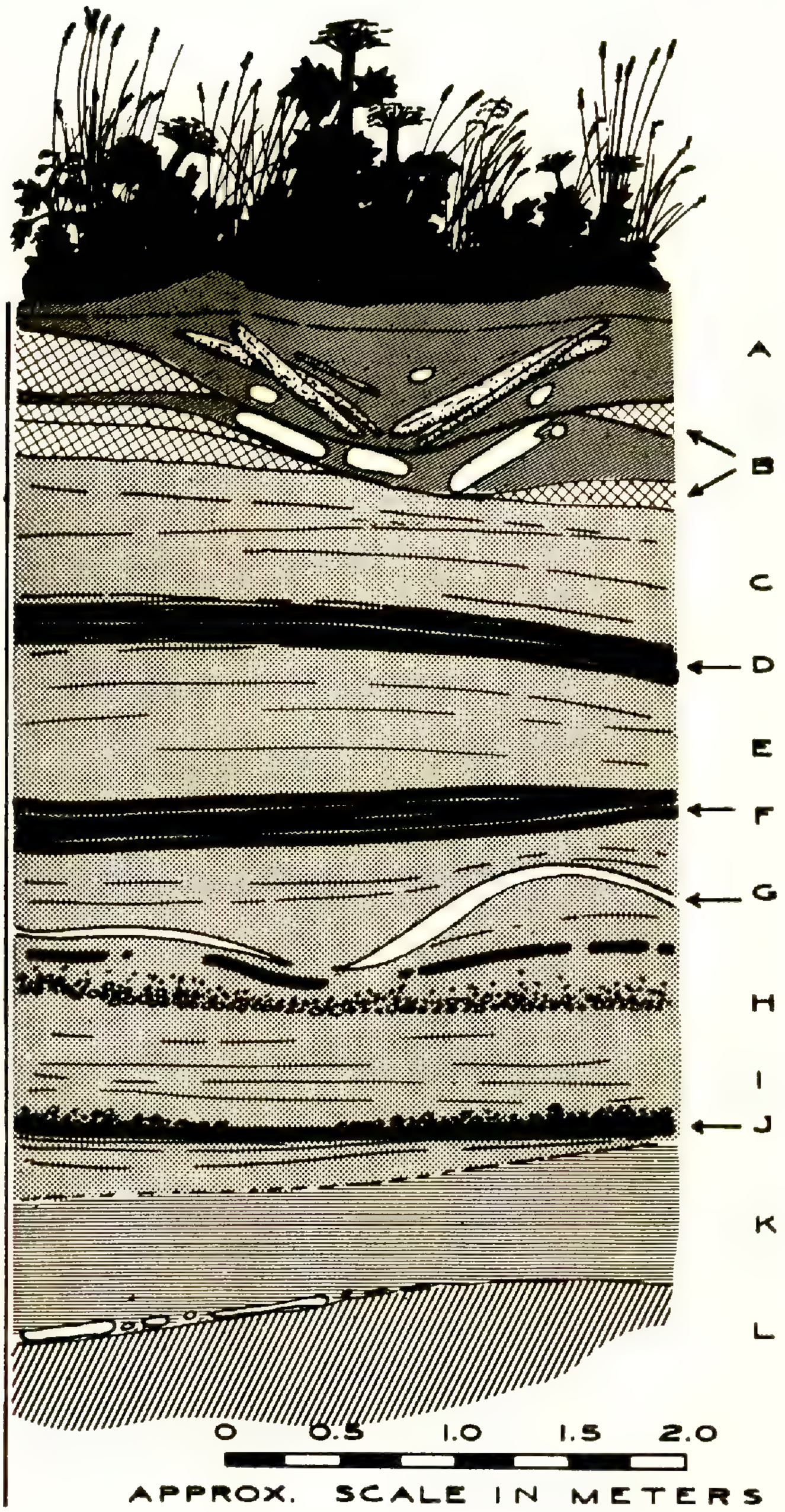


Fig. 1. A generalized profile which resembles an actual soil profile exposed at Tanaga island, Aleutians. Typical old village site vegetation (Heracleum, Elymus, Angelica, Aconitum, etc.) is indicated at top. Below are: (A) recent humus with remains of old barabara (Aleut semisubterranean house) evidenced by whale ribs and large stones used in construction; (B) midden deposits, mostly sea urchin and clam shell; (C, E, I) strata of light pumiceous ash, slightly banded; (D, F, J) strata of black humus which provided samples for radiocarbon dating; (G) ferrugineous band; (H) coarse, pumiceous ash; (K) light-brown clay horizon; (L) bedrock (basalt). Such profiles as this were prepared for each collecting site. The basis for a drawing was made by photography, and an outline sketch was prepared. Then the actual exposure and the note-book data were used for completion of the profile.

Fig. 2. Atka Village, Nazan Bay, Oct., 1950.

Fig. 3. Detail of an alpine meadow, Adak, Aleutians. Shown are Anemone narcissiflora var. villosissima (foreground) and Lupinus nootkatensis, both characteristic of such habitats.

## ARCHAEOLOGY

The archaeological work during 1950 consisted of reconnaissance for old village sites and burial caves and intensive collection of ethnobotanical materials, such as wood, shell, grass matting, and humus, from selected sites, for dating by the carbon-14 method. No major excavations were attempted, but activities were confined to excavation of test trenches and burial caves.

In 1950, during nine days of exploration on the southwestern side of Tanaga Island, three village sites were discovered. An unnamed offshore rock in Lash Bay was visited, and here the party found a fairly deep cave containing, besides Aleut skeletal remains, a stratigraphy of sorts in the earthen floor. Layers of dirt, compacted grass matting, partially charred plant and animal remains, and wood, contained a number of artifacts of worked stone, wood, and bone. The collections from the cave were ferried with some difficulty by rubber life raft across a treacherous rip tide to be landed on Tanaga. These specimens are at present at the University of Michigan for study.

The 1950 party dug test trenches at Eider Point on Unalaska Island and secured a number of artifacts and organic earth samples. The site appeared to be large and fairly rich, so it was decided that a more representative sampling was necessary. The 1951 Michigan group landed at Eider Point to undertake four days of excavation which gave important results. A good assortment of artifacts was recovered. The mound proved to be approximately 30 feet deep, and organic soil samples were secured from archaeologic layers just above the old cobble beach. Further and more complete excavation of this site is highly desirable.

In August of 1951 the expedition concentrated upon a major archaeological excavation at Amaknak Island (Dutch Harbor). The mound was previously described by both Dall and Jochleson but not seriously investigated. An Army doctor, Dr. Alvin R. Cahn, stationed on Dutch Harbor Island during the last war, collected samples of worked bone and stone during the construction of a military road through the mound. Some of his collections were sent to the Chicago Museum of Natural History. Most of the mound, however, is untouched. The 1951 work was confined to the southeastern corner of the site. A cut was made on an area 12 by 15 feet to a depth of more than 22 feet, at which sterile volcanic ash was encountered. Approximately two thousand worked artifacts were recovered from levels to a depth of 20 feet. Samples of wood, shell, charcoal, and organic earth were also collected and these should give good dating of the site. This excavation is important to the study of Eskimo pre-history, for it is one of the few carefully done, stratigraphic excavations yet accomplished in the Aleutians and it was made on a small island where, from other mounds, Dall, Jochelson, and Hrdlička all assembled large artifact collections with only slight accompanying data and no organic samples for dating.

Preliminary field examination of artifacts recovered from Eider Point and Amaknak revealed an apparent difference in cultures. Art styles, point types, and matrix formation of the mounds differed considerably. Inasmuch as Eider Point and Amaknak are separated by only a few miles of water, it is clear that the villages could not have been inhabited simultaneously but that one is definitely older. Laboratory examination of the collections, together with carbon-14 dating of the site levels, must be completed before a final analysis of the two cultures can be made.

## ETHNOLOGY

Sincere appreciation is acknowledged for generous cooperation provided members of the Michigan field parties by the Alaska Native Service and the Territorial Department of Health. This cooperation made possible an examination of all A. N. S. and Health Department files pertaining to the Aleuts. It was important that this research be accomplished, for records, especially economic and medical, concerning the Aleut populations even ten years ago are becoming increasingly difficult to find. Records prior to 1938 are almost non-existent.

Results of these surveys are still not tabulated except for a few preliminary findings. The latter indicate, however, that available medical and economic data for Aleutian populations can provide a substantial basis for evaluating the trends of acculturation and the problems which have beset the Aleut since Russian and American administrations have been responsible for his welfare.

Recent X-Ray studies by Health Department teams indicate an extremely high tuberculosis rate among isolated island communities and a lower (but still high) rate in villages near and on the Alaskan Peninsula where imports of outside commodities are more available. Three Aleutian villages, Atka, Nikolski, and Unalaska, were visited recently by Health Department personnel for X-ray examinations. A preliminary tabulation of their data reveals the following tuberculosis rates:

| | Present Population | pop. X-rayed | those tested with active TB, suspected TB, or recently healed lungs |
|---|---|---|---|
| Atka Village | 83 Aleuts | 40 % | 37 % |
| Nikolski Village | 53 Aleuts | 87 % | 57 % |
| Unalaska Village | 120 Aleuts | 75 % | 18 % |

The Michigan parties conducted ethnological and ethnobotanical investigations in the villages of Atka and Nikolski (1950) and Unalaska (1951). Preliminary results show that more than 65 local plants were used for foods, medicines, and poisons by the former Aleut people.

Today, however, only a small percentage of these plants are utilized or even recognized by any but the oldest living natives. Other ethnobiological data which have been assembled, both from living informants and from gleanings of perishable archaeological materials, will be sorted and analysed for indications of (1) changes in Aleut plant and animal uses, illustrating acculturation processes, 2) variations of natural history lore among subdivisions of the Aleut ethnic group, and, 3) distinctions among former Aleut cultures and neighboring cultures, with the objective of defining the position of the Aleut culture type in North American anthropology.

## ZOOLOGY

Studies in the zoological sciences, except for ethnobiological investigations, were conducted entirely on Adak by volunteer members of the expedition, serving with the U. S. Navy. Dr. Walter Weber, M. D., an amateur ornithologist, has compiled a valuable list of all birds, transient and native, to be seen in the vicinity of Adak. Mr. Thayne C. Parks, a graduate student in zoology at the University of Washington, conducted important studies of some of the invertebrates, especially marine gastropods. He collected crustaceans and flatworms on Adak and is completing an ecological study of fresh water habitats. Identification and critical analysis of his material must await his return from Naval service, but it is expected that it will be carried out.

## APPRAISAL OF FIELD WORK

Until collections are better studied, results of the field work cannot be available. Preliminary appraisal of field data, however, indicates that the new information will give (1) a better understanding of plant distribution and ecological patterns in the Aleutians, based largely upon the lesser known plant groups such as the bryophytes, (2) a chronological correlation between volcanic activity and Aleut prehistory, (3) dating of materials from important burial caves and stratigraphically excavated old village sites, (4) information about a large number of hitherto unreported archaeological sites suitable for future archaeological investigations, (5) an understanding of ethnobiological trends among prehistoric and historic Aleut populations and an analysis of the trends of acculturation, (6) additions to our general knowledge of the flora, fauna, and human populations of the Aleutian archipelago.

# THE WOOD COLLECTORS' SOCIETY: ITS OBJECTIVES AND ACTIVITIES

Jeannette M. Kryn

THERE are probably few people who are not interested in collecting objects of some kind, perhaps stamps or minerals, or antiques and old coins. Collecting may be a hobby or related to a profession, but usually it stimulates a desire to learn more about the objects. The collector of wood, however, has almost always been aroused to interest in his material before he begins collecting, and as he adds specimens that interest is intensified. Many trailside museums assign space to blocks of polished wood of the trees of the local area. Without doubt the specimens arouse some aesthetic appreciation of their beautifully colored heartwood or wonderful luster, but the casual observers rarely wish to acquire similar specimens for themselves. The cabinet maker, amateur or professional, who is well acquainted with the infinite variety of wood figure, hardness, luster, and color, almost always has a collection of special blocks which he delights in showing to other people and to which he is constantly adding. He thus becomes one type of enthusiastic wood collector. The second type is that rather rare and somewhat peculiar botanist, the wood anatomist, who must become a wood collector if he is to survive in his profession. He can appreciate the macroscopic beauty of the wood, but he can also see beyond the color, luster, or figure to the microscopic patterns of the cells, and the most colorless specimen may be the most fascinating to him. He is concerned with gathering together as many members of a botanical family as possible, in order to compare their anatomical structure with their flower morphology.

The two distinct groups of wood collectors have different objectives, although they are alike in their desire to possess as many different and interesting samples as possible. The first act of the non-botanist is to cut down his specimen to a piece of a standard size without bark or knots, and, if possible, with both heartwood and sapwood visible. The block is then sanded carefully until the smoothest possible surfaces are attained and it is an object of beauty. It is given a number, and a filing card is prepared with such data as the scientific and common names and perhaps the geographical source. If the name of the wood is unknown, frequently the aid of a professional wood expert is enlisted to identify the specimen. When a wood anatomist receives a piece of wood, however, his first act is to cut a small area on transverse, radial, and tangential faces with a razor blade, in order to examine the structure with a hand lens. He may even prepare thin sections for microscopic study. Then he adds it to his collection in the state in which he received it, preferably with the bark intact, for bark

Today, however, only a small percentage of these plants are utilized or even recognized by any but the oldest living natives. Other ethnobiological data which have been assembled, both from living informants and from gleanings of perishable archaeological materials, will be sorted and analysed for indications of (1) changes in Aleut plant and animal uses, illustrating acculturation processes, 2) variations of natural history lore among subdivisions of the Aleut ethnic group, and, 3) distinctions among former Aleut cultures and neighboring cultures, with the objective of defining the position of the Aleut culture type in North American anthropology.

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is frequently as interesting to him as the wood itself. If the specimen is a mere fragment, he is quite content to file it in a small box or bottle to prevent its becoming lost. He will keep several series of filing cards, for number, family, genus and species, and common name. His greatest disappointment is to receive a specimen which has no herbarium material in support of the identification or which has not been identified accurately to species in the field. Unfortunately, botanical taxonomists do not trust the work of the wood anatomists sufficiently to accept an identification that is based on a study of anatomy alone, and if the systematists are ever to be induced to recognize the importance of wood anatomy to classification, research must be carried out on authentic specimens only. The wood anatomist would like to have the aesthetic satisfaction of owning a beautifully sanded, uniform collection of wood blocks, but he knows that the time spent in preparation would be wasted, since at any moment he might wish to cut off a cubic centimeter at one end in order to make permanent slides for microscopic study, or he might disfigure another corner in an attempt to expose a perfect radial surface. The two types of wood collectors might be compared to two music-lovers in their enjoyment of a particular performance. The untrained listener delights in the organ-like beauty of a piano composition without knowing how the sound is obtained. The trained musician, however, not only is enraptured by the music, but is deeply appreciative of the expert use of the sustaining pedal or the legato playing of the artist.

The wood collection of the American Museum of Natural History originated shortly before 1880. The founder was Mr. Morris K. Jesup, the President of the Museum, who believed that scientific and industrial study of American forests would be facilitated by making available specimens of little known woods. At the request of Mr. Jesup, Charles Sprague Sargent, famous botanist and dendrologist of Harvard University, searched the forests of the United States and secured large trunk specimens and herbarium material over a period of more than five years. The specimens were cut to show bark, and cross and longitudinal sections of the wood, both polished and in natural state. These were supplemented by selected planks or burls, when the tree was of commercial importance. In Sargent's description of the woods of the Jesup Collection (Sargent, 1885), 412 species are listed.

One of the largest collections of woods in the world is that of the Yale School of Forestry. The total number of catalogued specimens at the end of 1947 was 44,579, representing 236 families, 2866 genera, and 12,582 named species (Hess, R. 1948). Many of the Central and South American woods were obtained on collecting trips conducted by the late Dr. Samuel J. Record, who was Dean of the School of Forestry until his death in 1945. Dr. Paul C. Standley (1945) says of him: "He elevated wood collecting from its former status of guesswork and curio gathering to a truly scientific occupation, insisting that the samples of wood should be accompanied by determinable herbarium

specimens and thus be associable with described species of plants . . . Many of the individual lots of woods, some of them small but important, were secured with the help of amateurs to whom he communicated something of his enthusiasm." Some of the "enthusiastic amateurs" form part of the membership of the Wood Collectors' Society. There are many other important institutional wood collections, among which may be mentioned those of Syracuse University and the Chicago Museum of Natural History.

The writer's career as a wood collector began in 1940, when Dr. Harry R. Muegel included the identification by hand lens of American woods in his course in dendrology at the University of Cincinnati. For the next four years, while pursuing the study of wood with great zeal, as a hobby, the writer was self-appointed, unofficial curator of the wood collection of the University. Many of the specimens were duplicates of those at Yale, given to Dr. Muegel after he had obtained his doctorate under Dr. Record's direction. In February, 1943, in the course of correspondence about other matters, Dr. Record mentioned a collection of about 135 small glass vials containing wood dust for which he had no immediate use. The vials had been prepared by Mr. W. F. Opdyke of Cleveland, Ohio, a wood craftsman and wood collector. He had saved the dust remaining after the sanding of each of the highly colored woods he prepared for inlay work in the table tops he had fashioned. Dr. Muegel requested the vials, hoping that the dust might prove a convenient method for studying fluorescence in woods, but a letter from Mr. Opdyke dispelled that hope because it indicated that contamination possibly had occurred. The letter told about other "woodnuts" who made a practise of collecting and exchanging specimens, and included a long list of Opdyke duplicates available for the asking. Several weeks later a very friendly letter arrived from Mr. Henry J. Dentzman of St. Louis, another "woodnut", with the offer of duplicates of his specimens. Unfortunately, the pressure of work at that time prevented the checking of the Cincinnati collection to determine what species were lacking and the correspondence came to an untimely end. Later the writer moved to Ann Arbor and still later to Buffalo, where the need for a personal wood collection was urgent. Then in August, 1949, the invitation to join the Wood Collectors' Society arrived from Mr. Archie Wilson, the secretary of the organization, who had learned of the existence of a potential member from Dr. Theodor Just of the Chicago Museum of Natural History, and Dr. Muegel. Several other members were old acquaintances, for Mr. Dentzman was the current president and Mr. Opdyke was member No. 1 and the first president.

Mr. Wilson, in response to my request, recently related to me the history of the Society. I shall quote from his letter: "At first there were about a dozen collectors in this country and about a half dozen in foreign countries, all working independently. A few became acquainted in odd ways. One would write Professor Record and he would mention

in reply that there was another kindred soul somewhere and give the address. Art Koehler at F. P. L.[ Mr. Arthur Koehler of the United States Forest Products Laboratory] used to pass along names too. A few letters to foreign forestry departments came to the attention of staff members likewise interested in collecting and brought back not only official but personal letters. W. F. Opdyke, our deceased first president, started the ball rolling [by] asking for names . . . To all he broached the idea of a Society and it met with enthusiastic response in most instances . . . Record, Hess, Koehler, Fritz, and other top men endorsed the idea and Koehler agreed to attend the organization meeting, as did Fritz. It was held at Nogle's summer cottage in the woods near Newton, Texas . . . Opdyke was elected president, Dentzman vice-president, Nogle treasurer, and Gilbert secretary. Notices were put in Tropical Woods, The American Forester, Wood, Wood Products, etc., and the members began to roll in. The organization meeting was held in April, 1947, and the first Bulletin was [issued] March, 1948."

There are now more than 150 members from 29 of the United States, from England, New Zealand, Australia, Africa, Ceylon, Canada, The Netherlands, Mexico, Chile, Monaco, the Philippines, Portugal, Cuba, Scotland, Japan, and Germany. Some are botanists or wood technicians connected with schools, museums, laboratories, or forestry departments. Others are concerned with industrial arts and have some technical knowledge or scientific interest. Still others have adopted wood collecting as a hobby, usually after having been interested in wood craftsmanship. This group includes lawyers, doctors, engineers, architects, mailmen, and garage mechanics. Many of them have developed a scientific interest in the structure and classification of their specimens. In the summer of 1951, three honorary members were elected: Dr. Robert W. Hess, coauthor with Dr. Record of "Timbers of the New World", formerly of the Yale School of Forestry but now in the commercial field; Dr. H. E. Dadswell, of the Australian Division of Forest Products; and Dr. B. F. Kukachka, of the United States Forest Products Laboratory at Madison, Wisconsin. These three men are outstanding in their field and have been very helpful to the members of the Society who have asked their assistance.

The organization is unified by the publication of a monthly bulletin, "Wood Collectors' Society Bulletin", currently edited by Mr. Archie Wilson. The last number was Vol. 5, No. 4, for April, 1952. It is a mimeographed paper, of about 10 to 18 large pages, which contains lists of wood specimens available for exchange or sale, news of various members, short biographical sketches of members, more or less learned discussions of families of woods or trees or other strictly botanical material, and informal accounts of collecting trips engaged in by groups of members. These expeditions are described with all the enthusiasm of sportsmen discussing a hunting trip. They really are hunting trips, with the objectives rare trees.

A standard size has been adopted for specimens, but few collectors adhere to it, chiefly because some collections were begun long before the organization of the Society and do not meet the standard, or because some members want representatives of specific trees, regardless of the size of the piece. Specimens are exchanged, preferably, or sold for 25¢ to 50¢ each. Because of the non-scientific training of many of the Society members, mistakes in identification or naming are inevitable, although accuracy is the keynote, and most members strive to prevent or correct errors. One of the objectives listed in the Constitution of the Society is: "To cooperate with institutions, universities, schools, and forestry departments in the augmenting of their scientific collections of herbarium specimens and woods and to receive aid in the botanical naming of specimens."

Some of the collectors have become specialists in a particular genus of woods, as for example Quercus or Crataegus, and they will add only those woods to their collections. Others are interested only in American woods. Perhaps it should be noted here that one of the most unusual collections of a highly specialized nature was made by a non-member of the Society who probably has never considered himself a wood collector. During the months that Professor Harley H. Bartlett of the University of Michigan spent in Sumatra, he cut stems of many woody plants that he termed "treelets" because even at maturity they rarely attained a diameter greater than one inch, even though they reach a great age. These wood specimens are a foot or more in length, have intact bark, and are accompanied by herbarium material. The collection was greatly increased after he left Sumatra by the expert native collector (Rahmat) whom he trained.

Many members of the Wood Collectors' Society utilize their most beautiful specimens in the creation of distinctive wooden objects. Mr. G. Wade Earle of Cleveland Heights, Ohio, makes wooden salt and pepper shakers for his own collection and also for others who send him the wood. J. A. Larralde of Bishop, California makes candlesticks of all shapes and sizes from his wood specimens. Dr. Earnie Munson of Phoenix, Arizona has prepared his specimens in the form of buttons of many forms. He is a retired optician and quite naturally specializes in fine, small-scale woodwork. Mr. Bernard G. Hildebrand of New York has prepared an unusual collection that consists of especially selected areas of the remarkably variegated wood, Brazilian rosewood (Dalbergia nigra). The grain and color form patterns that resemble mountains, the seashore, or sunset scenes, and each specimen selected could qualify as a wood picture. One of the most famous non-standard collections in the world, the Rudolph Block Collection of Walking Sticks, was assembled before the origin of the Society. Mr. Block was best known as Bruno Lessing, the author of a newspaper column, "Vagabondia". He made a collection of interesting woods of the world and used the walking stick as a medium for emphasizing the varieties and

beauties of his specimens. The woods were obtained from timber dealers, foresters, explorers, scientific institutions, and friends, in a period of less than four years. Mr. Block created the designs for the canes and handles, and they were then fashioned by the best cane-makers of this country and abroad. There are 1400 sticks, with 950 named species and 550 genera represented. Many variations in the grain, burls, curly, wavy, ribbon, bird's-eye, and crotch, were used in making the handles. Since Dr. Record had determined the identity of most of the original specimens, the collection, estimated to have cost $25,000 to prepare, was given to Yale after the death of Mr. Block in April, 1940. (Record, S., 1941).

There are few organizations whose members are as enthusiastic and as friendly. A. W. C. S. member seems to be guaranteed a welcome whenever he chances to visit a town containing a fellow Collector. The enthusiasm, however, is readily understood. What other organization has so fascinating an objective as wood collecting?

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EDITORIAL NOTES. -- An apology is owed for the unduly late appearance of our No. 3, for July. It was almost ready for press at the same time as No. 2, so far as the major articles were concerned, but was held for timely news items and notes to fill little empty spaces at the ends of articles until H. H. B. returned from a trip to the Northwest, especially for study and collecting of Oenothera and Betula. Also a little article on the introduction of Oenothera Lamarckiana into the Northwest, promised to Bradley Moore Davis for this number, was to have been finished and run. R. McV. had got out No. 2 and then left for his botanical expedition to Mexico. H. H. B. too soon found himself flattened out in the University Hospital with a coronary thrombosis, instead of doing anything good and useful, for several weeks.

Mr. Lawrence F. Van Manen of the University Press and Mrs. (Dr. Ruth) McVaugh have attended to getting out this issue, and any lack of newsiness we shall try to make up for later, for No. 4 will follow before the end of the year, and A. G. B. will then be definitely established, we hope, as a quarterly on a regular schedule.

# A BOTANICAL MISSION TO OKINAWA AND THE SOUTHERN RYUKYUS

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TWENTY-THREE years of ambition to supplement my herbarium work on the botany of eastern Asia by new field experience was finally rewarded by a three-months collecting trip in the Ryukyu Islands in the summer of 1951. The position of this chain of mountain tops, surviving as serried islands between the broad, deep Pacific and the shallow East China Sea, vividly suggests a flora transitional between that of Japan and of Formosa, and the extensive tropics. This link is botanically not well known, especially to western students, since much of the published information is hidden away in Japanese. Even by the Japanese it is referred to as the dark region of Japanese botany. So my trip, from the botanical point of view, seemed to promise an interesting and profitable summer in assembling material for interpreting this flora. The trip was made at the request of the Pacific Science Board of the National Research Council, supported by contract funds from the Department of the Army. Its success is due to the excellent preparations by the former, to the generous support of the latter, to the assistance of many civilians, and especially to the eager participation of my Okinawan associates and their keen knowledge of the flora .

## Collections Made by Westerners

The first Americans to botanize in the Ryukyu Islands were naturalists on the Perry Expedition which opened Japan to trade in 1852 - 53. More significant collections were made by Charles Wright, naturalist with the Second American Expedition to Eastern Asia under Commanders Ringgold and Rodgers, which left the United States seven months after the Perry Expedition. The botanical specimens from these two expeditions were studied by Asa Gray, but no major publications were ever issued (2). E. H. Wilson, of the Arnold Arboretum, collected woody plants in Okinawa, the Kerama Group, and Amami-Oshima in 1917, and published a description of the vegetation and a plant list in 1920 (9). His large collection of photographs is at the Arnold Arboretum. The next Americans to collect here were a few natural-history-minded servicemen with the U. S. Army of Occupation, among them being Lee T. Burcham (1), John W. Carow, J. Towne Conover, William D. Field, Allen Phillips, and R. W. Steidman. A few Europeans have collected in these islands off and on since the middle of the 19th century (3).

## Collections by Japanese

The largest collections have undoubtedly been made by Japanese botanists, the principal ones being Noriaki Fukuyama, Isao Hurusawa, Seiichiro Ikeno, Hiroshi Ito, Tokutaro Ito, Yojiro Kimura, Genkei Masamune (5, 6), Jinzo Matsumura, Shigeru Miki, Takashi Naito, Genji Nakahara, Masasuke Ogata, Yaichi Shimada, Juryo Suzuki, Tokio Suzuki, Setsusaburo Tanaka, Yasusada Tashiro, Zentaro Tashiro, Tomekichi Terasaki, Takasi Tuyama, and Yoshimatsu Yamamoto. The principal Japanese botanist currently interested in this area is Masamune Genkei, now of Kanazawa University. He has published a number of papers on this area (5, 6) and hopes to continue, although much of his material lies in Formosa, unavailable to him.

## Collections by Okinawans

A few native Okinawans have been diligently collecting plants during the last few decades and one or two private herbaria have been accumulated. The principal resident botanists who have collected and studied this flora are Tetsuwo Amano (formerly Tetsuro Kanashiro), Zenshu Nakazone, Sakuya Sonohara, Yoshihisa Taira, Eigen Takamine, and Shinjun Tawada (8). They have worked with and sent specimens to the Japanese botanists who have named and published on their collections, especially G. Koidzumi, Zentaro Tashiro, Jisaburo Ohwi, Siro Kitamura, and Motoji Tagawa. Publication by the Okinawans has been practically impossible, but a few manuscripts have been prepared and mimeographed (8). About their most recent production is an annotated enumeration of the wild and cultivated plants, originally prepared in tabular manuscript form by S. Sonohara, S. Tawada and T. Amano, and entitled Flora Okinawensis. The authors' introduction to this flora is the source of the above information on the Japanese and Okinawan botanists. This manuscript was prepared at the request of the directors of the Education Department of the American Naval Military Government on Okinawa and of the Okinawan Civilian Administration, at the instigation of the naturalist servicemen previously referred to. Listing

Fig. 1. Sakuya Sonohara, principal author of Flora of Okinawa. Teacher at North Agricultural and Forestry High School, Nago, Okinawa. Photograph by W. G. Urseny.

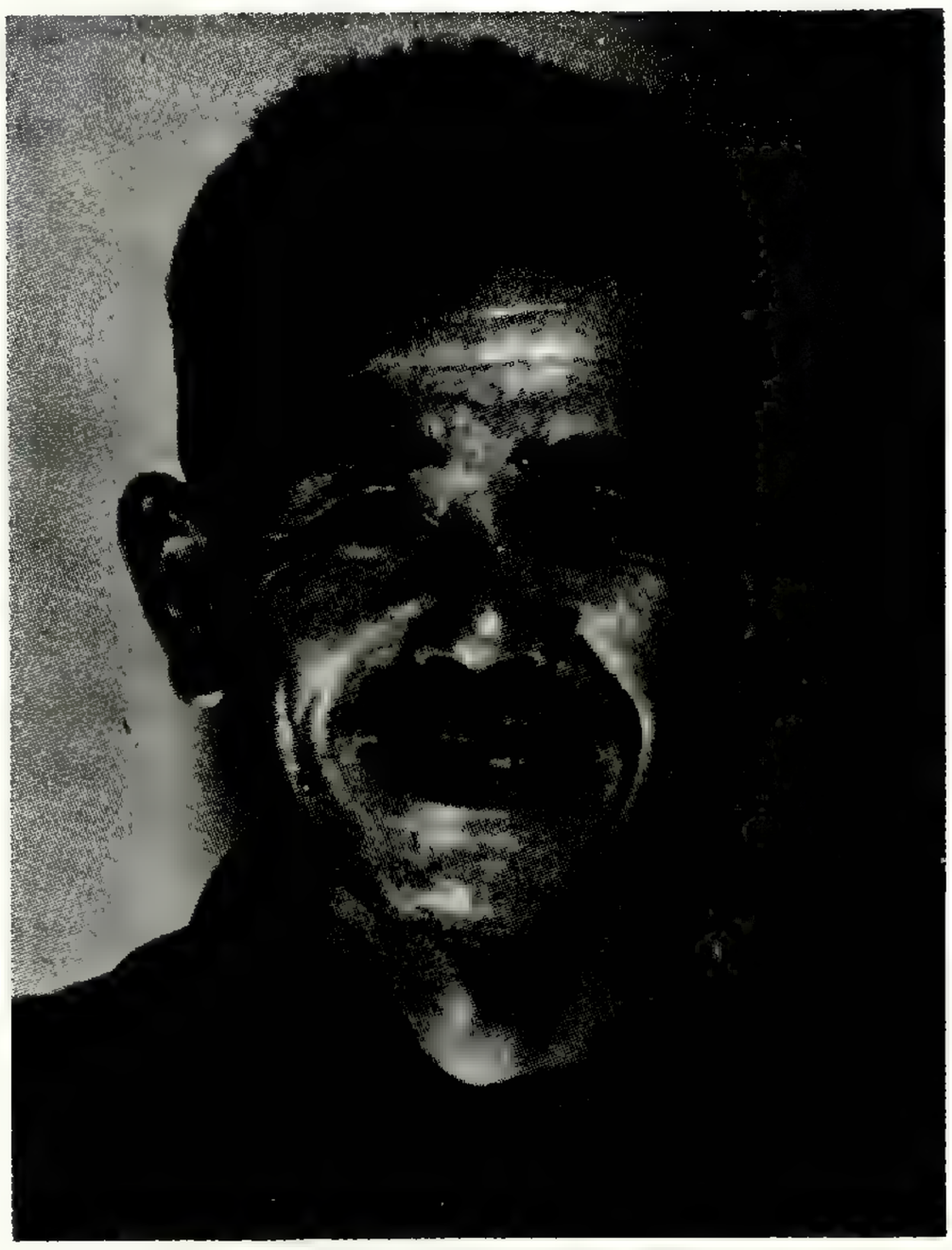

Fig. 2. Shinjun Tawada, employed by General Affairs Dept., Legal Section (Immigration) Civilian Government, Naha, Okinawa. Photograph by W. G. Urseny.

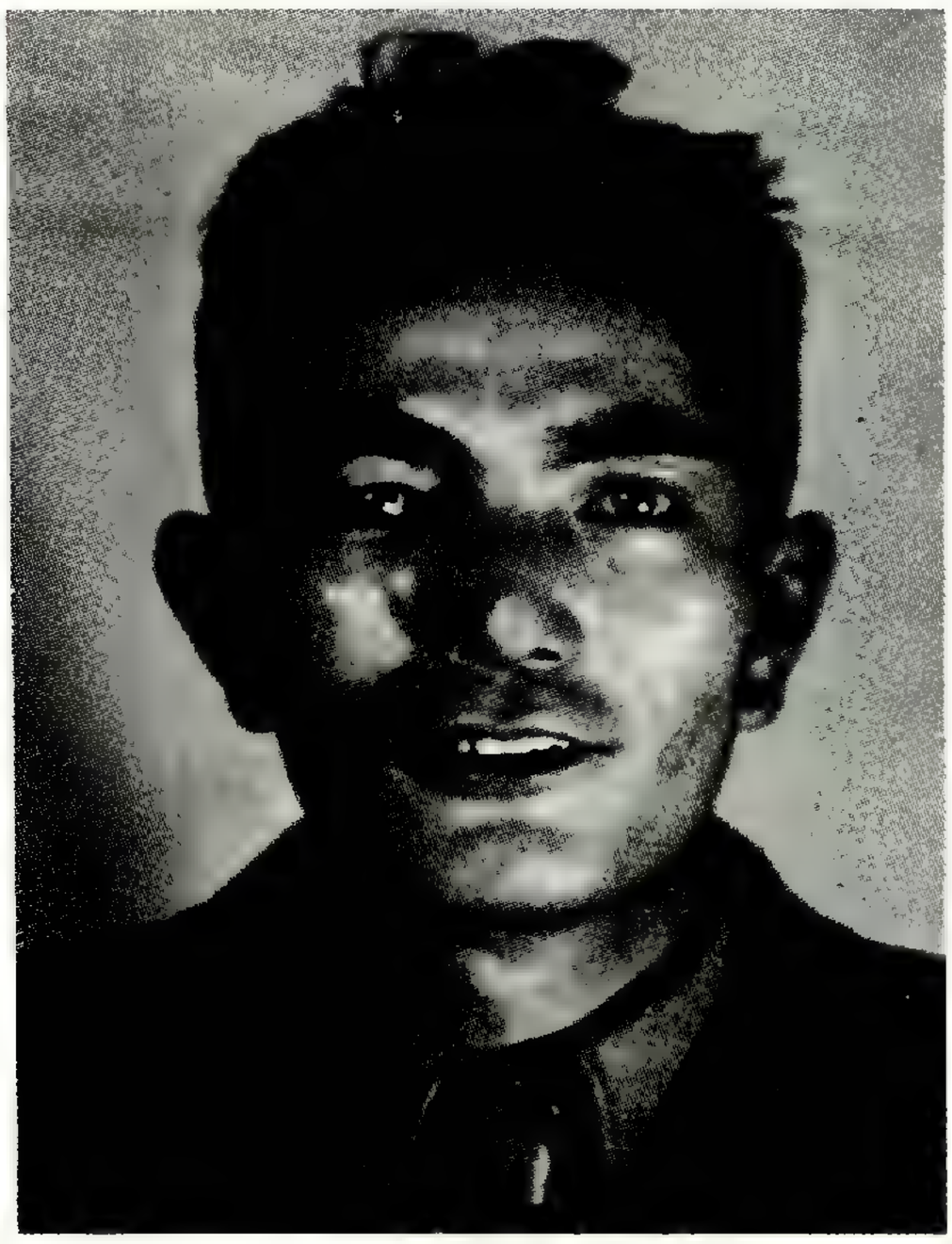

Fig. 3. Tetuo Amano, employed by Agricultural Dept., Natural Resources Section, Civilian Government, Naha, Okinawa. Photograph by W. G. Urseny.

about 2500 species with Latin, Japanese and Okinawan names and notes, this Flora was founded largely on Sonohara's recollections of his herbarium, which was unfortunately destroyed in the war, aided by reference to a few somewhat unsatisfactory Japanese works. Mr. T. Amano is working toward an enumeration of the plants of all the Ryukyus and has an extensive manuscript in preparation. The Okinawan botanists are now equipped and trained for needed general collecting that may be done, and are continuing to collect, in so far as their bread-and-butter occupations permit.

## The Flora of Okinawa and the Scientific Investigation of the Ryukyu Islands

The "Flora Okinawensis" was brought to the United States by A. W. Galston, one of the returning servicemen naturalists. Eventually I edited it, making certain additions, so that, when issued, probably with the title Flora of Okinawa, it can be a useful tool to guide the Okinawans and others in further plant collecting and in the eventual preparation of the much-needed full flora of this area. It was while I was engaged in this work that the opportunity came to participate in the "Scientific Investigation of the Ryukyu Islands", commonly designated and hereafter to be referred to as the SIRI program. This was developed by the Pacific Science Board.

Aimed to supply scientific information needed in improving the economic status of the Ryukyu people, the SIRI program calls for basic investigations in various fields, as well as immediate application of scientific knowledge in solving current problems. My own objectives were (1) to supply botanical assistance as desired by agricultural, forestry and other administrative authorities, (2) to collect herbarium material to document the manuscript Flora of Okinawa, (3) to train local botanists in current plant collecting techniques and perspectives, and (4) to help establish a reference herbarium at the University of the Ryukyus, which would serve the personnel in forestry, agriculture, and other botanical enterprises. The Flora of Okinawa is now being mimeographed by the Food and Natural Resources Division of the U. S. Civil Administration in Okinawa. When issued it will have economic applications too numerous to mention.

## Botanizing in Okinawa

Enroute to Okinawa, where I arrived on 13 June 1951, I visited various Japanese botanists and institutions to enlist their cooperation in identifying my Ryukyu collection, since effective publication will require careful coordination with the past Japanese work. In Okinawa, housing, transportation, supplies and other needs (i.e., "logistic support") were provided me by the U. S. Army. The Okinawan botanists, Messrs. S. Sonohara, S. Tawada, and T. Amano, the authors of the manuscript "Flora of Okinawa", were assigned by the Okinawan forestry and agricultural organizations, in which they are employed, to work with me. The Yogi Agricultural Institute, in Naha, the capital of Okinawa, supplied laboratory space. Travelling by "jeep", supplied with considerable sacrifice by the U. S. Army, we made many collecting trips in Okinawa through June, July and early August, operating in conjunction with Dr. Floyd Werner, from the University of Vermont, SIRI entomologist, and his Okinawan associates. Then Mr. Tawada and I shifted to the southern Ryukyu Islands, which are included in the Flora of Okinawa, since this work covers Okinawa-ken or Okinawa Prefecture, in which the Japanese included all of the Ryukyus south of Amami-Oshima. Collecting was conducted on Iriomote Island from the 14th to 26th, and on the 30th and 31st of August; on Yonaguni Island on the 28th and 29th of August; on Ishigaki Island from the 1st to the 6th of September. These islands are among those now under the Yaeyama-gunto or local governmental administration with headquarters in Ishigaki city on Ishigaki Island. (The U. S. Civil Administration unit is the Yaeyama Civil Administration Team, commonly called Y-CAT.) So far as I am aware, no Americans had previously collected on any of these southern islands. On the return trip to Okinawa, limited collections were made during an over-night stop on Miyako Island, where is located the headquarters of the Miyako-gunto, and the Miyako Civil Administration Team. I departed from Okinawa for Japan and the United States on 19 September, attended the 16th annual

meeting of the Botanical Society of Japan in Tsuruoka, Yamagata Prefecture, on the 22d to 25th, and reached Washington on the 30th.

About 1500 numbered collections, totalling nearly 8000 specimens, were brought back. The first set will remain at the Smithsonian Institution. One set will go to Japan for identification, another will be deposited at the Bishop Museum in Honolulu, and a representative set will be returned to the University of the Ryukyus, when facilities have been provided there for its preservation and use.

Collecting with the Okinawan botanists was a most pleasant and satisfying experience. I was guided by their knowledge of the vegetation and terrain. They had previously guided various Japanese botanists, but I believe our operations in the summer of 1951 were the most extensive ever undertaken in these islands. We collected throughout Okinawa, mostly around Naha, the capital, but also working out from the town of Nago, about the center of the island, and from Okuma Beach and Hentona, farther north. Several peaks were climbed, especially Nago-dake, Yonaha-dake, Tanyu-dake, Katsu-dake and several smaller mountains. The exposed headland on the north cape was visited, as well as mangrove swamps on the east coast and other plant formations in numerous localities. (See appended list.) The collections are numbered in one sequence in my own continuous series, but the associated collectors' names appear on the bilingual labels, which were printed in Okinawa. These labels show that these specimens were collected on the SIRI Program. Since my Okinawan associates were familiar with most of the species collected, their sight determinations were recorded in the field notebooks and on the labels. All these specimens will, however, be critically redetermined.

The specimens were all dried at the Yogi Agricultural Institute between ventilated driers, mostly aluminum corrugates, over kerosene lanterns. Those of the southern trip were painted with a mixture of alcohol and formalin, and tightly wrapped in heavy paper or rubberized sheeting soon after they were collected. Subsequently they were dried in the regular manner at our headquarters on Okinawa Island. Most of the collections so preserved made fair specimens, but a few were lost through molding.

## Some Vegetational and Floristic Features of the Ryukyus

It is impossible here to describe the flora adequately, for the results of three months of field work have not yet been analyzed. Only some outstanding observations on the vegetation can be mentioned.

Southern Okinawa. Much of the land is treeless and consequently rather barren in appearance, largely a result of the war, which destroyed most of the trees and disrupted the plant cover, leaving the land subject to invasion by the weedy vegetation. Most conspicuous is the coarse grass Miscanthus floridulus, which is abundant almost

everywhere and, with the ever-present palm-like tree, Cycas revoluta, gives a somewhat ragged appearance to the landscape. Other weedy

Fig. 4. Cycas revoluta, one of the most striking plants of Okinawa. Pinus luchuensis in the background.

plants abound, including some true American weeds that came with the invasion. Just now no one has time or energy to expend on the alleviation of this drab condition, for the severity of life in Okinawa calls for full attention to labor for immediate subsistence. Possibly some of the plant materials now growing in the Saion Forest Nursery will find use in roadside and landscape plantings as well as in more economically important reforestation projects.

Northern Okinawa. The depression induced by the treeless war-torn southern area fades away as one goes north beyond the zone of major war activities and current military operations. Here forests cover most of the higher mountains, which may reach to near 2000 feet. The lower slopes, from which the original forests have long since been removed, if not terraced for the cultivation of sweet potatoes, may be covered by pines or by various scrubby plants, or

Fig. 5. Pinus luchuensis. Typical wind-blown pine: looking southward near Kin, on west side of Okinawa Island. Photograph by W. G. Urseny.

dominated by Cyas revoluta and shrubs. Some slopes are covered largely with tree ferns or bananas, the latter of value chiefly for fiber production. The forests remaining higher on the mountains have long been exploited by the people through selective cutting of the more useful trees, such as Shima, Castanopsis, Quercus, and other hardwoods. The commercially less valuable trees may, therefore, be more abundant. Areas ravaged by fire are occasionally seen. The destruction of the forests has been somewhat limited by the primitive exploitation methods used and by lack of adequate access roads. The higher peaks usually have a zone of dense, almost pure-stand bamboo thicket on or near their summits. The range of habitats from barren sea coast and mangrove swamps to dense mountain forest is adequate for a large flora and much remains to be collected and studied.

Iriomote Island, the next to the westernmost one in the chain, is a striking contrast to Okinawa. Iriomote is approximately 14 miles in diameter, and is mostly mountainous with the highest peak, Goza-dake, reaching to about 1350 feet. The shore-line is indented by drowned river valleys. The island is all or mostly composed of sedimentary

Fig. 6. Miscanthus, Pinus, and cutover area. Looking south from Highway 25 (Awase Area). Nakagusuku mountain in background. Photograph by W. G. Urseny.

rocks, largely sandstones and shales with many coal seams, the only such deposits in the Ryukyus. In a few places there are low plateaus of the same type of limestone that underlies all of southern Okinawa. Almost the whole island is covered by a mixed evergreen broadleaved type of tropical forest in which oak and Castanopsis luchuensis are the most economically important trees. The river and estuary margins are usually lined with mangroves, behind which come Pandanus and many other woody plants of tropical alluvial flats. Often, where these formations have built up the land sufficiently, rice fields have been established. On the few limestone flats or plateaus which were observed, the forest was very different, containing especially various

species of Ficus. Most of this land, however, was grassland or cultivated fields.

The population of Iriomote is very small and is confined to a few villages at strategic sites on the coasts or in the bays. The prevalence of malaria is given as the reason for this small population. However, the village of Sonai is said to have no malaria. This village, with its neighbor Hoshitate, is refreshingly neat and trim, with pleasant and contented people. The war left very few marks on this island.

No wheeled traffic was seen anywhere on this island during my stay, except on the short coal railroad in the north. Access to the interior is by boat or on foot or horseback along trails, a fact which, along with the rumors of malaria and the status of this island as a forest reserve under the Japanese, probably explains the generally undisturbed condition of this forest. For a botanist, Iriomote has greater charms than any other of the Ryukyu islands which I visited.

Lumbering operations by the American operators of the coal mines were designed principally to obtain mine timbers, but are no longer being carried on. The logging roads are eroded and fast disappearing. The mines were in operation in 1951, but their future is uncertain. One crop of rice is raised annually in Iriomote and sweet potatoes are common, but are said to be fed to pigs. The rice is eaten by the people or exported.

Japanese botanists have named a number of endemic species of plants from collections which they have made in Iriomote or from those which have been sent to them by resident Okinawans or Japanese. We collected in the lower regions and penetrated the interior by boat and afoot only in the western and northern part. We did not reach the highest spots, the vegetational aspects of which gave no promise of great diversity. On a trip up the tidal part of the Urauchi River, by boat, the following major woody plants were noted: Rhizophora, Kandelia and Bruguiera, as typical mangroves, and their common associates Barringtonia racemosa, Cerbera odollam, Shefflera octophylla, Textoria iriomotensis, and Heritiera littoralis. Tree ferns were common as well as the palm Arenga engleri, the climbing screw pine Freycinetia, Ficus of various species, Rhododendron (a few in bloom), Fraxinus, Ilex spp., Macaranga, Pongamia pinnata, and many others. Undoubtedly further collecting at a botanically better time of year than August would yield valuable material. We saw little Cycas, in striking contrast with its abundance in Okinawa. In a mangrove swamp at the head of a bay, we were taken by poled sampan to a vigorous clump of the nipa palm, Nipa fruticans, not previously recorded from the Ryukyus, although Japanese botanists later reported having found it on an island just south of this one.

Travel to and from Iriomote depends on the whims of the weather, meagre and unprofitable commercial shipping, and at present an

Fig. 7. Nipa fruticans Thunb. in a mangrove swamp at the head of Hinai Bay on Iriomote, the northernmost occurrence of this useful palm, hitherto unrecorded.

Army-operated boat. Small diesel-powered strange-looking native craft came and went sporadically and might be used if time, comfort, and safety were not valued too highly. For restful isolation, Iriomote is idyllic.

Yonaguni Island is a limestone plateau 7 miles east and west, and 2 1/2 miles wide. Under favorable conditions, Formosa is said to be visible toward the west from high eminences. Precipitous cliffs, rising from narrow beaches or from the pounding surf, seem to surround the island. Coral reefs were found on the southern shores, but were absent on the northern side. Two peaks rise above the plateau, Urabu-yama, 740 feet high in the east, and Kubura-dake reaching only 600 feet in the west. The only towns are Sonai, the seat of government, on the north, Hinai on the south, and Kubura at the west end. Transportation is mostly by horseback, and pack trains are often seen. An American-built road, said to be 9 miles long, is ushering in the motor era, but smoother and botanically more profitable transport by foot was our preference. The American government's recent interference with a lucrative but illicit trade with China and Formosa dulled the affections of the local adults for American botanical interlopers in 1951. The isolation of Yonaguni far exceeds even that of Iriomote, but as a pleasant retreat, it can hardly be recommended at this time.

The original forest is entirely gone and only the hills are clad with trees, all second growth. On the slopes of Urabu-yama we collected Ficus kingiana, Evodia glauca, Ardisia sieboldii, Maesa tenera, and

Citrus depressa, among other plants. High on a northern sea cliff east of Sonai, we collected specimens of Suzukia luchuensis Kudo in its type locality. The surface of the plateau is mostly rolling grassland or cultivated fields. Grazing cattle, goats and horses were seen, especially on the summits of high sea cliffs. There are said to be a half-dozen water buffaloes on the island, a beast not seen in Okinawa. Hedges of various shrubs, Pandanus, Agave and other plants, seemed to mark off fields and to confine the grazing. Generally this end of the Ryukyu chain is drier than farther north, and apparently warmer. A long, high escarpment toward the southern side of the island is densely clothed by a bamboo plantation, probably Pleioblastus hindsii, the only evidence of a bamboo industry seen in these islands. The culms are said to be exported. Rice and sweet potatoes are naturally the principal crops, the former said to be mostly exported, the latter consumed by the people. Our visit lasted little more than a day, and our journeyings and observations were correspondingly restricted. We were guests of the ranking American colonel on his inspection trip in the local police boat, and shared in the official welcome and entertainment provided by the Yonaguni local government.

Ishigaki Island, a short distance east of Iriomote, is in many respects quite a contrast to both of those just described. It is approximately 8 miles in diameter with a long northeastern peninsula and smaller peninsulas to the northwest, west, and southwest. Its shore is low, without such striking high cliffs as characterize Yonaguni Island. Coral reefs practically surround the island and on the south run far out to sea. There is no harbor, but this southward stretching reef gives protection in good weather to an open shallow roadstead off the city of Ishigaki. Typhoon refuge is sought in Funauki Bay on the far side of Iriomote Island, visible to the west. The southern half of the island is a raised and eroded limestone shelf above which rise a few higher hills. It is extensively cultivated, the principal crops being sweet potatoes, wet-land and upland rice, and sugar cane. Pineapples were seen and enjoyed. The island's rolling surface is crossed by roads and is dotted here and there with small woodlots, consisting mostly of Casuarina equisetifolia, Acacia confusa, and Melia azedarach. Farmers reach their fields from more or less distant urban habitations by means of springless carts or on horseback over roads best traversed in nothing finer than a hardy jeep at modest speeds. Agriculture and forestry are ably promoted by an agricultural high school, by the Heigina Agricultural Experiment Station, and by a forestry office with nurseries and experimental plantations. The gunto government is reported to be financially aiding settlers from overcrowded Okinawa to clear and plant sections in the northeastern parts of the island.

Forested mountains ascend in the northern half, reaching to about 1700 feet in Omoto-yama. A misdirected, but no less botanically successful expedition aimed at this highest peak revealed, near the foot

of the mountains, the building of a dam for a water supply and for irrigation. Thriving lumbering operations used water buffaloes for snaking out sizable logs for timbers and for saw-logs. Timber cutting was much in evidence, and old charcoal ovens were seen. Our guide was a gunto government forester who checked on the various operations for their conformity to local regulations. The top of the "false summit"

Fig. 8. Omoto Mountain on Ishigaki Island, looking over the bamboo zone on an outlying peak. The mountain also is capped with this almost pure stand of bamboo.

which we reached was capped with a pure stand of bamboo, from which we looked across an impenetrable saddle to our original goal on the highest peak, likewise bamboo-capped.

Although much of the wild vegetation in the cultivated land was of weedy appearance, in the east there were strikingly smooth grassy pastures of rolling uplands and rounded knobs. Their smoothness and well-grazed appearance was in sharp contrast with the unkempt aspect of the grass-covered portions of Okinawa. Here Imperata koenigii, not yet in bloom, seemed to be the dominant species, though many other grasses and sedges joined in making this rich-appearing cover. The characteristically rounded hills are etched horizontally by grazing paths, though the full extent of the grazing industry could only be guessed. The scene was unduplicated anywhere else that I visited in these islands, and its beauty was unmatched. The yellow-green of the grass-covered slopes was set off by the dark forested mountains above and by the varying blues of the sea and the coral reefs on the fringing shore, their limits marked by white lines of surf. Departing

views of the northern shore, overhung by jungle-clad mountains, as seen from the "Wakaba Maru" slipping through a glassy Pacific of indescribable blue, left memories of a beautiful island that suppress memories of the discomforts of botanizing under humid tropical conditions.

Miyako Island. This flat limestone island, almost entirely under cultivation, is the seat of the Miyako-gunto, and the Miyako Civil Administration Team of the U. S. Civil Administration of the Ryukyus, with jurisdiction over a sizable archipelago. It was visited only over night and half a day. Botanically it had little of interest. Weeds, cultigens, and the widespread littoral vegetation were the same that was seen elsewhere.

## Scattered Observations for Future Visiting Botanists

At the present time, a western botanist in the Ryukyus is essentially dependent on the U. S. Civil Administration for housing, sustenance, and transportation. I was given the excellent reception and cooperation expected from the U. S. Army, being substantially a civilian in its employ. Dependence on native public transportation, except perhaps locally in Naha, is hardly possible; indeed, it is forbidden for all American personnel by the controlling military authorities because it is over-crowded by the Okinawans. Special bus transportation in the southern part of the island is provided for Americans by the "Occupation". Native housing facilities are poor and over-taxed by the demands of the people. Okinawans are sensitive about their substandard housing, and rarely invite Americans to their homes. With the permission of the Army, hotels and inns may be used in some places, but naturally they are far below western expectations. They are not, however, "impossible" and life with the Okinawans may be most pleasant, if one takes things as they are without making constant comparison. There is great initial difficulty in breaking through the social and psychological barriers which isolate the western establishments and in getting into harmonious touch with the Okinawan community. Both cultures must be open to a visiting botanist. Language difficulties were hampering, but are not insurmountable. Tawada's English enabled us to enjoy life and to work together, and I trust my successors will fare better. The adverse economic status of the Okinawan botanista must not be overlooked, in spite of their devotion to botany. Doubtless the use of the equipment left by the SIRI program at the University of the Ryukyus could be obtained by botanists going there.

Most of the doleful advance warnings of difficult conditions under which I should have to work in Okinawa were unrealized. The conditions imposed by Nature were far from ideal, but I saw only one live "habu", the much-advertized poisonous snake of these islands, and experienced no typhoons, a circumstance one should not expect to be repeated. Austerity of Okinawan living leaves a wide gap between the customary

Okinawan and American standards. My associates were graciously tolerant of my special needs. Any visitor can take reasonable precautions against potentially dangerous food and water, as I did.

## The Status of Botany in the Ryukyus

The local botanists of Okinawa are handicapped by lack of literature in Japanese, and by lack of means for publication. More formal basic training in botany, especially economic botany, is greatly needed. Printed material on the local plants and animals prepared by the Okinawans is another urgent need for teachers, students, and other interested persons. There is now practically nothing of this nature.

Botanical aid was given by the writer in various projects, notably in agriculture and forestry, and the preparation of a booklet entitled "The Important Trees of the Ryukyu Islands" was initiated at the request of the Forestry Section of the Food and Natural Resources Division of the U. S. Civil Administration in Okinawa. Efforts were made to arrange for housing and curatorship of the projected herbarium at the University of the Ryukyus and it may eventually become a reality. The Okinawan botanists gained new perspectives and learned new techniques in plant collecting, and the quite adequate equipment that had been purchased was left with the University for future use. Additional collections by my Okinawan associates have already been received. Identification of all these as well as the Okinawans' earlier collections, some made by U. S. servicemen in the Army of Occupation, and the specimens available at the U. S. National Herbarium collected by C. Wright and E. H. Wilson, will go far toward substantiating the Flora of Okinawa. Practical considerations will prevent study of much if any of the Japanese collections. Unfortunately, the edition of the Flora of Okinawa now being prepared will not incorporate the results of the 1951 work. Efforts are continuing to assist in furthering and improving botanical work in Okinawa, which is greatly hampered by lack of reference material. The library at the new University needs contributions.

Vegetational and ecological studies, and economic botany, rather than pure taxonomy, except for the establishing of a working herbarium, are the urgent fields now to be advanced. Okinawans need much assistance in these fields, although I feel such guidance must be based on a careful understanding of what already is known and is being done by the local botanists and agriculturists, and of Japanese work in adjacent Japan and Formosa. Introduction of new plants should be made with the greatest of care and only after careful study of what is already available.

Okinawa Island in summer is hot and humid. The Ryukyus are washed by the well-known Japan current, called "kuroshio" or black current, which brings north the heated water of the South China Sea. The monsoon winds, therefore, are hot and moisture-laden. Sporadic

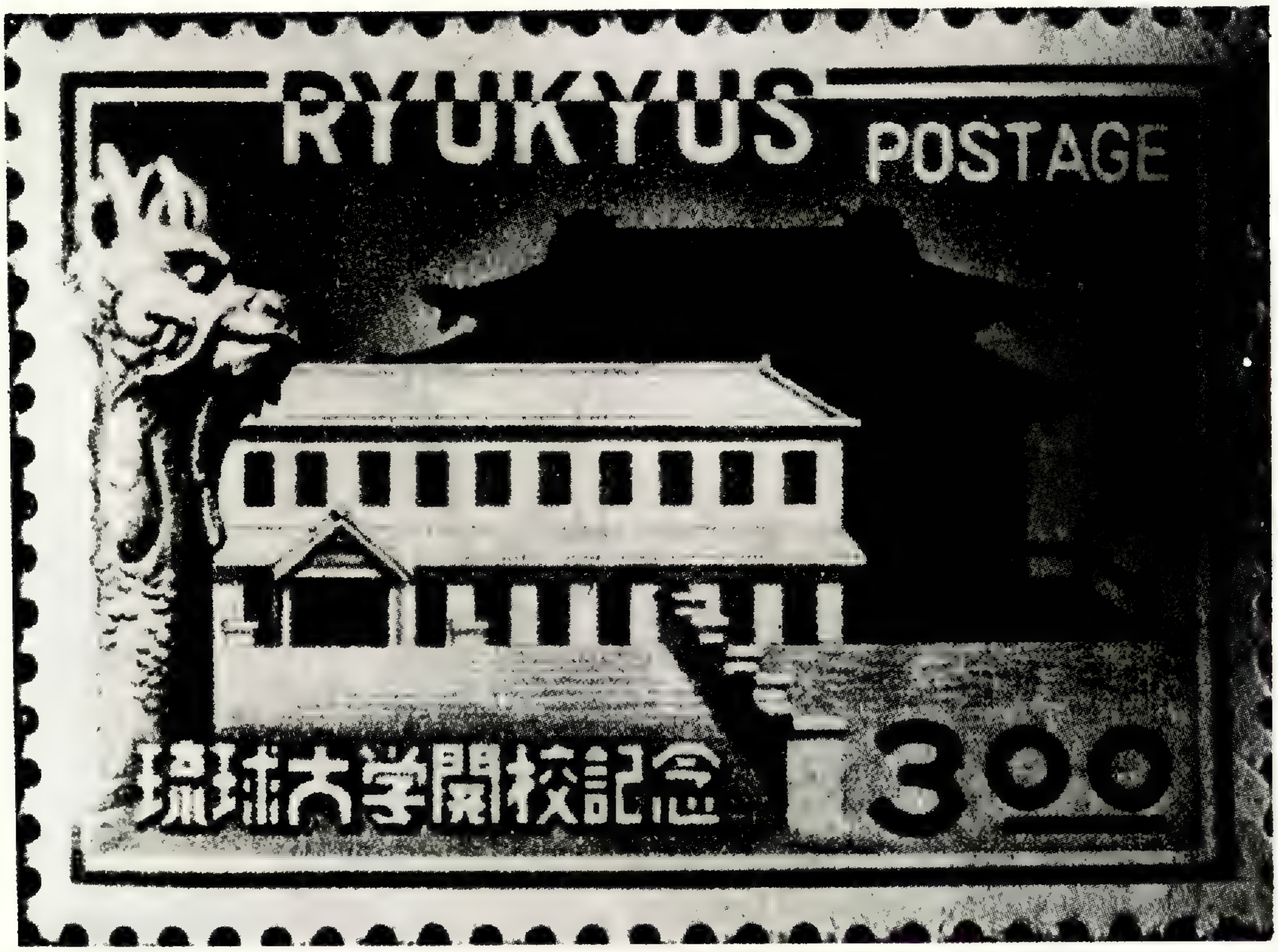


Fig. 9. A view of the new University of the Ryukus, which occupies the site of the old Shuri Castle, which was destroyed during the war. A "ghost" picture of the Castle commemorates the unfortunate loss of the historic old structure. (From a current postage stamp of the Ryukyus.)

typhoons raging up from the south are dominant factors in the life of the region. The wreck-strewn shores of Okinawa are a constant reminder of their force and man's impotent defiance. These typhoons must be an important factor in the natural selection of the vegetation and their effect should never be overlooked when choosing economic plants for trial introduction into the Ryukyus.

During 1951 Dr. M. Y. Nuttonson of the American Institute of Crop Ecology was in Japan and Okinawa making extensive studies preparatory for establishing agro-climatic analogues for use in guiding and encouraging the introduction of plants that can improve the local economy. He is preparing a critical report on Okinawa; that on Japan is already issued. Because the Flora of Okinawa contains the cultivated plants already known in Okinawa, it should be of much help in further introduction programs, in spite of its preliminary or tentative status. Plant introduction is by no means a panacea for all ills, but introduces new ones. Sweet potatoes brought by repatriated Okinawans seem to be the source of a very serious blight and other pests. Mr. Alfred P. Messenger visited Okinawa during the summer under the SIRI program and aided in the preparation of quarantine laws and regulations for these islands.

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## SUPPLEMENT

### Principal Localities Botanized in 1951.

A. Okinawa Island (inclusive collection nos. 5718-6503, 6894-7155, 7318-7331).

I. Shimajiri-gun.

1. Naha and vicinity, especially near the Yogi Agricultural Institute, the Saion Forest Nursery and Namino Uwa, a shrine area on the coast: mostly cultivated and wasteland, rubble sites, and roadsides and city streets.
2. Shuri Castle Hill (University of the Ryukyus) and Shuri City: Roadsides, streets, and cultivated fields.
3. Chenan area, west of Buckner Bay (former Okinawa Civil Administration site): slopes reverting to grass and shrubs.

II. Nakagami-gun.

1. Goeku Ugan, 2 miles west-northwest of Awase village: wooded ravine near a village.
2. Uchikina, 1 1-2 miles northeast of Kadena Airbase: cultivated and waste fields.
3. Ishikawa Museum (Higassonna Museum): grounds and gardens.
4. Kachin Peninsula, especially White Beach and Teruma village: beach, limestone cliffs, sandy shore, and village pond.
5. Tomari village, 5 miles north of Yonabaru: about a limestone knob covered with second growth forest.
6. Nakagusuku Castle grounds: park-like ruins on limestone hill, partly wooded.

III. Kunigami-gun.

1. Nago, town and vicinity: roadsides, cultivated land, park, wooded shrine, sea beach.
2. Genka, on shore 6 miles northeast of Nago: steep deforested mountain slopes.
3. Taminato-ugan, on north side of Miyagi Bay: native virgin jungle.
4. Nago-dake, southeast of Nago: cultivated fields, reverting cultivated land, steep mountain slopes reverting to forest, and heavily forested mountain tops.
5. Tanyu-dake, 3 miles east of Nago: forested mountain.
6. Nakoshi, 3 miles northeast of Nago on Kantena-ko: cultivated fields and seashore.
7. Yabu, village on shore west of Nago: cultivated area.
8. Katsu-dake, on Motobu Peninsula: forested mountain peak.
9. Okuma Beach: sandy sea beach.
10. Hentona: sandy sea shore and town streets and gardens.

11. Yonaha-dake, southeast of Hentona: cultivated fields, second growth and little altered mountain forest.
12. Hedo-ishiyama, near north cape: wooded limestone mountain.
13. Hedo-misaki: exposed, treeless limestone plateau and headland.
14. Yona, village on west coast: steep deforested hillside above shore road.
15. Benoki-gawa (river): along road above river through deforested and reverting mountains.
16. Benoki-yama: forested mountain.
17. Nichime-dake: forested mountain.
18. Ogimi-mura, Taiho-fukujiyama, between Shioya-wan and Taira-wan: deforested hills and valleys.
19. Manzamo, near Onna-mura on west coast south of Nago: exposed summit of limestone cliff.
20. Gesashi-wan, on east coast: tidal flat at mouth of river with mangroves and marginal growth.
21. Kushi-mura, on east coast, south by east from Nago: edge of road-impounded pond.
22. Henoko-mura, on east coast, south-southeast of Nago: cut-over hills, stream bank, cultivated fields on uplands and on stream flood-plain.

B. Iriomote Island (inclusive collection nos. 6504-6794, 6865-6893, 7156-7167).

1. Shira-hama: village streets, bay shore and cultivated fields.
2. Trail from Shira-hama to Sonai: second-growth forest, cultivated fields, seashore.
3. Sonai: village streets, cliffs over beach, among cultivated fields.
4. Hoshitate: village streets, and mangrove swamp.
5. Trail from Hoshitate to the Urauchi River, north of Sonai-dake: cultivated fields, second-growth and mature forests.
6. Along Urauchi River, from end of trail to the falls: river-bank mangrove and upland broad-leaved evergreen forests.
7. Funauki-mura, on Funauki-ko: village streets and gardens.
8. Hidori-wan, off Funauki-ko: mangrove and upland broad-leaved evergreen forests.
9. Hinai-wan: sandy shore, mangrove swamp, village streets, and along coal railroad.
10. Nakara River, near head of tidewater: mountain forests and site of former American lumbering operations.

C. Yonaguni Island (inclusive collection nos. 6795-6864).

1. Plateau to 1 1/2 miles east of Sonai: cultivated and grazing land above sea cliffs and seaward slopes.
2. Sonai: village streets, gardens and shore.

3. Urabu-dake (or Urabu-yama): second-growth forest.

4. Enroute across center of island: open grassland, cultivated fields, ravine thickets and roadsides.

5. Hinai: village streets and gardens.

D. Ishigaki Island (inclusive collection nos. 7168-7298).

1. South central, mostly cultivated area: roadsides, second-growth forests or thickets, cultivated fields, etc.

2. Western and northwestern section, Nagura-wan to Kabira: littoral vegetation, grassy hills, second-growth forests, and village streets.

3. Eastern section, Shirabo to Nobaru-zaki: cultivated fields, grassy knobs, streamsides, and sandy beach.

4. Mountain area on south side of Omato-yama: second-growth and mature evergreen broad-leaved forests and bamboo thickets.

E. Miyako Island (inclusive collection nos. 7299-7317).

Southwest section, from Hirara-machi south to shore opposite Kurema-jima: roadsides and coral shore.

## Principal Organizations on Okinawa concerned with Plants

1. The Food and Natural Resources Department (F. & N. R.) of the U. S. Civil Administration of the Ryukyus, Naha (USCAR). The work of this organization is largely directed toward developing and aiding the Okinawan organizations. On its staff are American foresters, agriculturists, economists, fisheries authorities, and others. It provided support for the SIRI program, especially through the Forestry Section, which is carrying on this program by mimeographing the Flora of Okinawa. It will issue the booklet Important Trees of the Ryukyu Islands, when I have completed it.

2. University of the Ryukyus, Shuri Hill, Shuri. This is a recently developed and thriving institution with entirely new buildings on the site of the well-known war-destroyed Shuri Castle. Agriculture and botany are taught, the latter with economic emphasis. Its newness and preoccupation with educational problems hampers current attention to research. Hopes are entertained that a herbarium may be established under its care. Five teachers from Michigan State College taught here during 1951-52.

3. Yogi Agricultural Institute, Naha. This is an experiment station with considerable land, carrying on experiments and observations of various kinds. The Agricultural Section of F. & N. R. of USCAR is helping guide its activities. Its budget is augmented from USCAR funds. This institution furnished space for the operations of the 1951 SIRI Botanical Program.

4. Saion Forestry Institute, Naha. This is the headquarters for a series of forest stations through the island. It maintains a nursery for growing stock for reforestation and other plantings. The Forestry Section of F. & N. R. of USCAR has greatly aided and guided its work and supplied funds, most notably in this connection for the employment of S. Tawada, who was then assigned to work full time with me. Another worker was likewise made available for the first part of the season.

5. Department of Natural Resources of the Provincial Central Government of the Ryukyu Islands, formerly the Ryukyu Food and Agricultural Organization, Naha. The providing of food and the development of agriculture in many ways is its function. Mr. T. Amano, its specialist on tea growing and preparation, was assigned for considerable periods to work with me. His ardent botanical interest was invaluable.

6. Biological Society of Okinawa (Okinawa Seibutsu Gakkai), Naha. In the summer of 1951, this organization held monthly meetings in the Central Information Center provided by the Central Information and Education Division of the USCAR. Talks were given by members and the SIRI scientists were welcomed. Problems of conservation were discussed and laws recommended.

7. Ishikawa or Higassonna Museum, Ishikawa town. Although primarily interested in preserving cultural relics, its grounds are a botanical garden of much beauty and interest. A departing civilian employee of the U. S. Army and an ardent orchidologist left there his collection of live orchids.

8. Nago Agricultural Experiment Station, Nago City. This thriving station is carrying on valuable experimental work, including tea preparation. It is aided by the Food & Natural Resources Section of USCAR.

9. Nago Agricultural High School, Nago city. Its principal botanical importance from the SIRI point of view was its employment of S. Sonohara, the ardent botanist and inspirer of other botanists and senior author of Flora of Okinawa, who joined many of our excursions. He is known throughout the island for his fine personality and botanical knowledge.

10. Regional Forest Offices. These are established in various places. Their work is largely concerned with control of forest exploitation.

EDITORIAL NOTES --Dr. Chester A. Arnold's very interesting article in this number will usefully supplement one which recently appeared in "Science".[1] He took time in Arctic Alaska to make an interesting special collection of Betula glandulosa representing the range of variation of this species near its northernmost limit of range. We believe that his remarks on the unfrozen bottom of the great Arctic Mackenzie River and the tempering of the deep subsoil underlying the island and shore vegetation, by way of contrast with the deep and extremely cold permafrost of the tundra, open up a new approach for interpreting certain aspects of plant distribution in the Arctic. He informs us that his information about the lack of permafrost under the river and along the immediate edge came as a personal communication from Dr. Gerald R. MacCarthy of the U.S. Geological Survey.

Charles D. Richards, joint author of the article "Collecting Betula in Michigan" which appeared in our last number, has been appointed Instructor in Botany at the University of Maine, at Orono. He will take up his duties on September 1, as a member of the Department of Botany and Entomology.

[1]Arnold, Chester A. Paleobotanical investigations in Naval Petroleum Reserve No. 4, Alaska. Science 116: 61-62. 1952.

# BOTANIZING IN THE MOUNTAINS OF IRON, ORIENTE PROVINCE, CUBA

Grady L. Webster and Roy N. Jervis

ON the morning of July 3, 1951, we arrived in Havana on the SS. Florida, ready to begin botanical studies in Cuba under the auspices of the University of Michigan Botanical Gardens. We had conceived the idea during the spring of '51, when we discovered that both of us were interested not only in the flora of Cuba in general but in the specialized flora of the Cuban pinelands in particular. During the previous year one of us (Jervis) had been at the U. S. Naval Base at Guantánamo Bay; experiences in botanizing in Oriente province during that year are recounted in the first number of the current series of the Asa Gray Bulletin (3). This experience was useful in preparing for the new trip. Jervis had learned the hard way that travel in Cuba may be really difficult at times, and had equipped his jeep with a hand-winch and a built-in cabinet (to protect specimens and papers) in the rear bed.

Our expedition at first seemed fated to die still-born, for it looked as if the officials at the Cuban customs office were not going to let us bring the jeep into their country. Their excuse was that the cabinet Jervis had so painstakingly built into the bed of the jeep made it a truck. This problem in semantics was resolved only after several days of effort, during which time an agent took papers around to the proper officials while we languished at a hotel in Havana, watching our money drain away rapidly. The moral was clear that next time it would be best to register the car with some agency like A.A.A., or else to know the right person in Havana.

Our sole compensation was the day we spent at the Colegio de la Salle (in the suburb of Vedado) talking with the dean of Cuban botanists, Brother León, and looking over his important herbarium of Cuban plants. León was a most gracious host and entertained us with flashes of real humor and perception. He told us some stories about that eccentric botanist Ekman, who has already become legendary in many parts of the Greater Antilles; and he was half-seriously indignant that Dr. McVaugh had not accepted his new genus Victorinia (segregated from Jatropha).

The financial debacle at customs cut short our plans for exploration in Pinar del Río. We wanted to go up into the country where the famous relict genus Microcycas grows, but at the town of Consolación del Sur we found that Sr. Manuel San Pedro, the authority on and protector of these rare cycads, had died. He had published an article with Dr. A. S. Foster about them (2), but we were unaware of it at the

time and could not find a guide. We turned toward the eastern end of the island, promising ourselves to return; but as so often happens, we weren't able to come back, and the famous pine savannahs of Pinar del Río had to be left for some future expedition.

After a short stop in the dry scrub country on the serpentine hills west of Matanzas, which we visited on July 11 and 12, we went on to Cienfuegos, in the province of Las Villas. A few miles east of Cienfuegos at Soledad is the Atkins Institution, a tropical botanical gardens and botanical research center administered by Harvard University. We arrived unannounced late on the night of the 12th, but were graciously housed in the dormitory, Casa Catalina, which has a splendid view of the Trinidad Mountains.

Friday the 13th we spent looking over the botanical gardens and the books and collections of plants in Harvard House, as well as in talking to Earl Smith, a forestry student who was interested in our expedition to Oriente. We soon decided upon making a joint expedition to the vicinity of Moa, a remote and little-visited area on the northern coast of Oriente province. We were interested in making as complete botanical collections as possible, particularly of the specialized pineland flora, and Smith wanted to survey the hardwood forests which he understood were being exploited by a lumber company at Moa. That evening we talked with Dr. R. A. Howard, who had been to Moa in 1941 with Brother Leon. He assured us that the area was well worth visiting.

So the three of us left the Atkins Institution Saturday morning, July 14, and drove steadily all day across the monotonous flat plains of Las Villas and Camagüey, which have been in large part overrun by "marabú" (Dicrostachys nutans), a pernicious leguminous shrub introduced from Africa. We camped for the night between Holguín and Mayarí, stringing our jungle hammocks between the jeep and a wire fence. The next morning we knew we were really in Oriente, when a few miles further across the bright green undulating fields of sugar cane, dotted with thatched huts ("bohios") and royal palms, we saw the great truncate, red-colored mass of the Sierra de Nipe, the westernmost of the "mountains of iron". The paved road soon became typical for Oriente; that is, it turned into a stretch of gravel and rock more like a stream-bed than a road. It was a beautiful sunny day, and we bumped merrily along, occasionally yelling "Adiós!" at the startled Cubans who came out in front of their bohios to stare at our bright red jeep, which, with the tarpaulin stretched over the huge mound of equipment in back, resembled some strange kind of overgrown beetle.

At last we entered the town of Mayarí, more or less the last outpost of civilization, where the road promptly became much worse than out in the country. It was Sunday morning, and the town seemed remarkably active and bustling. We finally discovered a place, looking none too sanitary, where we could have "café con leche" and rolls.

After a fruitless trip looking for two jungle hammocks that had somehow fallen out of the jeep, we loaded on a good many bananas, pineapples, custard apples, and avocadoes (fruit being the cheapest food available) and succeeded, not without the usual confusion, in finding the unmarked "highway" that led out of town.

Near the Rio Cabonico we camped for the night, for the mudholes here were too formidable to cross with assurance in the dark. Smith and Webster found a small tienda, where they ordered "refrescos" and practiced their bastard Spanish on the two very courteous women who tended the place. It was a really beautiful Cuban moonlit night, marred only by the persistent mosquitoes and cows over-noisily chewing their cuds behind the spiny live hedge of Bromelia Pinguin. The silhouetted leaves of the royal palms shone a dark blackish green over the banana fields, and in the distance rose the mysterious and fascinating dark outline of the Sierra Cristal. The coming week seemed pretty sure to repay us for the trip's frustrations.

The next day we wound a snake-like path over the coastal rocky hillsides, having some difficulty in determining where the "main" road was, and sometimes ending up in a dead-end in a sugar-cane field. The scenery coastwards was often beautiful, particularly along Tánamo Bay, where low rocky islets covered with palms and other shrubbery met the bright blue water. But the coastal hills themselves, which once must have supported an interesting pineland flora such as we found further east in Moa, were denuded and either planted in sugar cane or left to grow up in grass. In many places only the royal palms, fortunately protected from cutting by law, had survived the destruction of the original vegetation. Only once was there any worth-while botanizing; Jervis found a beautiful pink-flowered plant of Casearia crassinervis, one of the several interesting ilicoid-leaved species of the genus which have evolved on the serpentine areas of eastern Cuba.

East of Cayo Mambí we crossed the Rio Sagua de Tánamo by a picturesque ferry which was just large enough for one car and which the boatman operated by pulling hand-over-hand along a cable stretched across the stream. It was a photogenic contraption, and we all took a number of pictures of it. Just beyond the town of Cananova we had to become highway engineers to fill in a formidable mud-hole, only to become bogged down around the next turn. Fortunately some Cubans obligingly pushed us out. As we had just left the last town before our destination, we picked up a hitch-hiker to show us the way. After passing over a few low hills, we came out on a plain with the Moa country stretched out before us. Our spirits picked up, for there were pine forests stretching back over peak after blue peak until all disappeared in clouds on the horizon. We shortly found that the forests were badly cut over, but at least they were there. We began seeing new plants all around us. Webster was delighted to see three very different-looking species of Phyllanthus, the euphorbiaceous genus which he

especially wanted to collect in Cuba, and further on, as we gained altitude, there were beautiful clumps of Euphorbia helenae, a truly remarkable spurge (segregated in the genus Euphorbiodendron by Millspaugh) with shiny dark-green leaves and deep red bracts reminiscent of poinsettias but neater and more attractive. It would be a desirable ornamental for tropical gardens, unless its specialization for growing on soil with a very high iron content might possibly make it difficult to cultivate.

We began to have suspicions about our "guide" as the road became steeper and rockier and more untravelled. At first he had said that this was the only way to Moa, but later (after we had passed the last intersection where we could turn off) merely that it was the best. We went over the top of the Cerro de Miraflores, after having to stop again to fill in the road with logs and rocks, and entered the wooded country on the other side. Surely enough, as we had suspected, our guide lived near this road and had misled us purposely. We arrived at Moa at dark, and learned that we had passed by the overseer in Cayo Mambí, where he was waiting to catch a ride. His second in command took us to the guest house, where we unpacked and then went to the local restaurant for supper. The guest house, although not luxurious, did have plumbing, a battery radio, a tame parrot, and a "cocinero" who served us demitasses of Cuban coffee so we were quite comfortable during our stay there.

Moa turned out to have a lumber mill, a few tiendas and houses, and what was euphemistically called a "port", where the lumber was loaded onto barges. Near the port there was an open grassy space which served as an airfield. The single restaurant in town had something of the picturesque about it, but the novelty soon wore off. The menu consisted of vermicelli soup, rice, unbelievably inedible garbanza beans, some kind of meat, and "tostones" which are fried, starchy, indigestible green plaintains. There was usually, however, an entertaining dogfight going on under the table in the other half of the dining-room. We dined on the elite side of the restaurant, since our table had a table-cloth, and we suspected that they charged us twice as much as the everyday customers. At first we were suspicious about the water, and had an involved conversation with a boy who (we thought) knew a few words of English. Finally he understood us and said, "Of course it's good water; we get it out of the river!" Everyone had a good laugh at this, which put us in a frame of mind to become fatalists and we drank the water without worrying about it.

The next day (July 17) we were up early to have a cup of thick black Cuban coffee before taking the road towards Punta Gorda. For once we didn't worry about rain because there were no bad mud holes. The brick-red soil was covered with hard concretions of limonite, so that the road ran over a bed of iron. Halfway between Moa and Punta Gorda we investigated the vegetation.

Between the scrubby pines (Pinus cubensis) was an open scrub, in which Metopium venosum and Ouratea sp. were conspicuous, with a sparse understory of one or more species of Aristida. The Metopium, called "guao de costa" by the Cubans ("guao" being the generic term for poisonous plants), formed a rather attractive good-sized tree in places, and might be called the dominant hardwood species. The Ouratea is conspicuous from a distance because of the brightly colored bizarre fruits; the fleshy gynobase is a bright red and the carpels, which separate at maturity into fleshy drupelets, are purplish-black; the effect is that of a fruit turned inside out. The genus Coccoloba, which has a considerable development of endemic species in Oriente, was here represented by C. shaferi. In a shallow ravine where the scrub was thicker were a number of highly interesting plants, including a small magnolia-like tree which turned out to be Talauma minor, Siphocampylus patens, a rather common robust shrubby member of the lobelia family with pale green flowers (and the only species of this family seen in Moa), and Anastraphia recurva, the only species seen in Moa of this interesting genus of composites which is endemic to Cuba, Hispaniola, and the Bahamas but with most of the species occurring in Oriente.

Scattered among the pines were clumps of Dracaena cubensis, which is in many ways the single most remarkable endemic species of Oriente. Its habit, rosettes of long linear-lanceolate leaves set on the ends of thin stems in the manner of feather dusters, make it a conspicuous part of the landscape. The Cubans call it "guiñapo" and use it as a crude kind of soap; presumably it is the roots that contain the saponin-like substance (as in the yuccas of the southwestern U. S.), but we did not verify this point. Remarkably enough, the species was not scientifically described until 1942, when Marie-Victorin published an interesting article about it (6), pointing it out as an ancient floristic relic of African affinities. The only other species of Dracaena known from the New World is D. americana of Central America, which has a tree-like habit very different from the Moa plant. Marie-Victorin considered the Cuban Dracaena to be most closely related to D. Draco, the famous "dragon-tree" of the Canary Islands, and suggested that it was one of the remnants of the flora of an ancient land mass connecting the Antilles with Africa. It may be remarked, however, that Dracaena or a close ally (in the form of the "genus" Pleomele) is represented in the geologically recent Hawaiian Islands by several species, and we can scarcely invent a land-bridge to carry it there. It would probably be better to regard Dracaena as one of several "island-hopping" genera such as Lobelia, Plantago, and Vaccinium, which have been especially successful at long-distance dispersal. Even so, the Cuban Dracaena remains phytogeographically a very interesting plant.

Pressing on towards Punta Gorda, we arrived at the Río Yagrumaje,

which turned out to be the most attractive locality we visited around Moa. We parked the jeep by a tremendous Furcraea with an inflorescence ten meters high, crowded with bulbils. The stream-bed itself was really an enchanting place. Upstream from the road the cool water ran over dark serpentine rocks, forming deep crystal-clear pools that were ringed about by the dense vegetation. Except for some bothersome biting flies, it was a good place to go swimming. Along the banks the Cyrillaceae, represented by Cyrilla racemiflora (the same species as in the southeastern United States) and the attractive-flowered Purdiaea moaensis Marie-Vict. were conspicuous, along with Pitcairnia cubensis, a terrestrial bromelioid with racemes of crimson flowers, a Tabebuia with white catalpa-like flowers, and, less commonly, a handsome straight tree with beautiful rose-tinged glossy flowers and shiny green leaves, Bonnetia cubensis. Occasionally a number of bright green-and-red parrots would come squawking through the tops of the pines which covered the hillsides above the stream. Even more so than the rest of the Moa country, the landscape of the Rio Yagrumaje arouses contemplation of the passage of geologic time during which the streams of evolution have produced the strange medley of vegetation that surrounds the looker. One cannot help feeling that he is in a remarkable outdoor museum.

We decided that this was collecting enough for the day and turned around towards Moa. We were surprised on reattaining the Río Cabañas to find that it was now a huge roaring muddy torrent, and that the bridge we had passed over that morning was out of sight. All the heavy rain that we had seen up in the hills that morning seemed to have been funnelled into the Río Cabañas. But as the Cubans forecast, it went down so rapidly that in a couple of hours only a few inches of water were pouring over the bridge and we were able to cross. Back at Moa we found that Smith had also had a pretty profitable day, having been up in the hills with a lumber-truck. He had been caught in the rain, and had a good many stories to tell.

The next day we had planned to split up the same way, but as Smith's ride did not materialize, he, as well as a member of the Guardia Rural, went along with us. This time we planned to go as far east as we could, to the mines of Cayoguan and perhaps even to Cañete, where (we heard) another mining project was opened. We went into Punta Gorda on the way there, to drop off our hitch-hiker and buy some food. The view above the town was so striking that we all had to stop and take pictures of it. It would have been a revelation for a sociologist or geographer; nowhere had we seen nature exert a more compelling influence on a town. Everything was colored red by the dust: trees, roofs, and even the steeple of the church. In the background the deep brilliant blue of the Atlantic came up to collide in a surf-line of color. There was a port here also, where trucks from the mines up the valley of the Cayoguan came down with chromite ore. And to prove that this

was the most important community in the area there was a station of the ubiquitous Guardia Rural, who seemed to be a sort of Cuban synthesis of policeman and storm-trooper. We found that shopping in the business district was none too good; the chief commodity available besides Coca-Cola and rum was a vile-looking kind of salted fish. Since rum was only ten cents a bottle, it was easy to see why so many Cubans regarded it as the best investment.

From the coastal bluff on the side of which Punta Gorda was built you could not only look down to the dock but also east to the delta of the Cayoguan, where there was an extensive growth of mangroves. We drove on in this direction, promising to pick up our Rural Guard on the way back. In a few kilometers we came down into the lush valley of the Cayoguan. One branch of the road crossed the river and went further east; the other continued upstream toward the mines. The flora here was quite distinct from that of the Río Yagrumaje; although there were pines on the ridge-tops, they were replaced below by a forest of tall straight hardwoods with Euterpe and Bactris palms and lianas that were either Marcgravia or aroids. In places a dense undergrowth of a bamboo, Arthrostylidium, made walking a real effort. The flora was the closest to that of a tropical rain-forest that we had seen, for besides the lianas, such trees as Clusia rosea were conspicuous. However, it seemed here to be mostly second-growth, judging from its jungle-like undergrowth and monotonous composition, and we did not find the collecting of any sustained interest. The mining town of Cayoguan was more interesting than the flora, for it was the most primitive-looking village we saw in Cuba. Nearly all the houses were thatched bohios, and the scene suggested what a village in the South Sea Islands might look like.

We tried the other branch of the road but soon ran into a ford that looked too deep to cross with assurance, so we returned to Punta Gorda. Our hitch-hiking friend was nowhere to be seen, so Smith and Webster went up to the Rural Guard post to ask his whereabouts. Some linguistic confusion immediately arose, and an interpreter had to be brought up from "downtown" in the shopping district. The "jefe" of the post seemed somewhat suspicious of what these Americanos were doing in the area, and Smith and Webster had visions of being put up in the local jailhouse. But when all was made clear the chief naturally decided that plant collectors must be harmless, and everyone parted with friendly hand-shakes. Our friend, it appeared, had already caught another ride back to town; we never knew why, no one told us that in the first place.

As it was, we got back to Moa in time to take an excursion to the coastal plain near the port. Here was the type locality of Acacia Bucheri, a monstrously spine-armed tree described and illustrated by Marie-Victorin in 1944 (7). Jervis collected some seeds which later germinated beautifully at the University of Michigan Botanical Gardens.

The spininess has gone so far in this species that the seedling plants are armed with large spines from the first node above the cotyledons. Marie-Victorin suggested that the resemblance of A. Bucheri and the similar A. Daemon from western Cuba (and Sierra de Nipe?) to some African species might, as in the case of Dracaena cubensis, indicate African affinities in the Cuban flora.

Thursday, July 19, Jervis returned to the coastal plain area near the port while Smith and Webster took the jeep and a guide and drove inland to a place called Cayo Chiquita. This was a comparatively small "island" of hardwoods in a valley surrounded by pinelands on the higher slopes. The practice of applying the epithet "cayo" to such isolated areas of hardwoods is rather common in Oriente, and has its analogue in southern Florida, where the limestone outcrops running southwest of Miami are known as the Everglade "Keys". Smith was interested in surveying the area for such economically important trees as the júcaro (Bucida Buceras). As it turned out, the botanical aspects of our excursion, while interesting, were the least exciting. Our guide, a black, loquacious Jamaican, led us from where we had parked the jeep to a cornfield at the edge of the forest, and we were starting to go into the forest itself when we were surprised to see a large black-and-white bird sail majestically past and disappear into the tree-tops. Smith recognized it as an ivory-billed woodpecker, and we devoted a few seconds of silence to commemorating the occasion. The guide pointed to a dead tree in the middle of the cornfield and said that that was where the bird stayed (why it should have picked the most exposed spot in the neighborhood was not clear). He told us that we could attract the bird by hitting the trunk with the blade of a machete to make a ringing sound.

The mesophytic forest was full of ferns, epiphytic orchids, and the same liana (a Marcgravia) which we had seen in the valley of the Cayoguan. The number of woody species here was large and it was not clear whether or not the complex composition of the forest was the same as along the Cayoguan. After coming out of the forest we waited for a while in the cornfield, hoping that the ivory-billed woodpecker would return. It never did, but we were rewarded by seeing a trogon, whose red, white, and blue colors made him a truly regal-looking bird, as well as great flocks of green-and-red parrots that carried on aerial riots and screeching tree-top arguments. With Smith's binoculars we had a ring-side seat at this fascinating performance. The Moa parrots seemed to be in no immediate danger of extinction, for we saw them commonly elsewhere, often right along the roads. Nearly every house in Moa seemed to have one for a pet.

We marched back to the jeep feeling well satisfied with our hike, only to discover that someone had broken into the cabinet built into the rear bed of the jeep and had stolen all the bedding, as well as a knife, poncho, and tarpaulin. Our Jamaican guide didn't help matters

with a completely incoherent story about some dishonest character who lived in a hut down in the valley. Back at camp we told Jervis and the others the bad news, and our friend the Rural Guard went to work on the case.

As the afternoon was not yet spent, Jervis and Webster went down to the coastal terrace near the port, while Smith took the jeep off to investigate another small hardwoods "cayo". The chief attraction of the port area was the small grove of Acacia Bucheri already described. However, the low xerophytic scrub nearby was also very interesting. It was composed of at least two species of the by now familiar and decorative genus Tabebuia, a remarkable shrubby Jacaranda with the blue flowers of the familiar cultivated species but with very different xeromorphic leaves, several Melastomaceae and Myrtaceae, Casearia ophiticola, like many of the ilicoid-leaved Casearieae with extremely variable foliage, and a few orchids, including a Vanilla with thick fleshy green stems that sprawled along the ground. In some shallow seepage pools were two species of Utricularia (U. juncea and U. pusilla) and two sundews (Drosera capillaris and D. intermedia). All of these except Utricularia pusilla also grow in the United States, and Drosera intermedia incongruously seemed just as happy here as in the bogs of western Newfoundland.

Friday Smith went out on a truck which was bound for the "Gran Tierra", the local name for the Moa Range, about 15 miles inland. Jervis and Webster took the jeep back towards Cananova on the coastal road that our guide had refused to let us take on the way in. We stopped only a few times at first, for the pineland to the west of the lumber camp had been terribly devastated by fire and cutting. Then we came to the turn in the road where we could look down from the plateau (at an altitude of possibly 100 meters) onto the coastal plain, which was covered with two kinds of palm savannah. Beyond the lush green lawn-like expanse of the moist savannah to our right was a line of scrub along the shore, then the blue water of the Atlantic, and finally a narrow key or sand bar lying a few hundred yards offshore. Unfortunately we didn't have time to investigate this interesting-looking area of apparently moist savannah, as the road ran to the west of it across a more xerophytic area.

We descended from the plateau and came out into an area of grey-brown soil, quite unlike the red soil on the uplands, which supported a dry vegetation dominated by Copernicia rigida. The landscape had a park-like aspect but the vegetation would have to be classified as "charrascal", or scrub, since between the palms was a dense tangle of grass and xerophytic shrubbery. It yielded a number of interesting plants, including a very attractive purplish-flowered Jacaranda, the familiar Casearia ophiticola, and Phyllanthus orbicularis. This last, widespread on serpentine areas in Cuba, is a low intricately branched woody shrub quite unlike the annual or suffruticose species of

Phyllanthus in the United States; it belongs among the serpentinicolous xerophytes of the section Orbicularia, which has its center of development in eastern Cuba. Although interesting as an example of the evolution of the micro-sclerophyllous habit in Phyllanthus, it was soon eclipsed when at a stop a mile or two down the road, Jervis was puzzled about the identity of a very attractive pink-flowered shrub he had found. We were both surprised to find that it was another Phyllanthus (P. comosus), and we could understand why Britton had so summarily (but unjustifiably) made it the type of his new genus Roigia.

We soon reached the fork in the road where our guide had led us astray, and took the road toward the Cerro de Miraflores again. While stopping for lunch under the pines on the foothills, we could not help taking pictures of Euphorbia helenae, which here made a brilliant display of dark red and green. No less striking than the color of the plant was its behavior when cut, for a copious stream of latex spurted out under considerable pressure. We could not recall any other spurge as highly charged with latex.

The view from the upper slopes of the Cerro de Miraflores could hardly be called beautiful; the landscape was waterless, the trees sparse, the soil rust-colored and rocky. But looking westward out over the pineland on the slopes, the palm savannah down on the coastal plain, the thickets of trees in ravines, to the forested heights that off in the distance near Sagua de Tánamo rose to become the Sierra Cristal, one could not help being impressed by the atmosphere peculiar to this country. Directly in the foreground the bizarre green pompons of the Dracaena testified that a remarkable history was locked in these silent hillsides. Here we were standing on the core of the Greater Antilles, the ancient solid rock upon which much of the endemic flora of Cuba and Hispaniola must have developed. Perhaps since Jurassic times these mountains of iron have been the citadel where the especially characteristic groups of the Antillean flora have survived and evolved. Much as man has modified the scene, the country retains its primeval character. Since Columbus looked upon this strange coast in 1492 nothing much seems to have happened, and it is hard to imagine that these hills may some day be denuded like those closer to Mayarí.

Saturday, July 21, was our last day of field work in the Moa country. We had intended to let Smith have the jeep, but he caught a ride towards the "Gran Tierra" in a lumbering truck. We went up the same road afterwards with two of the Guardia Rural who said they had some information about our stolen equipment. We parked near Cayo Chiquita and after a few minutes of searching they discovered our gear neatly wrapped up in the tarpaulin. Everyone was happy, and we were only too glad not to bring charges against the thief, since we didn't want to get entangled in any legal complications. We took our passengers back to Moa and bought them beer, and then drove back out the road

toward the Gran Tierra. On the way, we found Smith and his guide and took them along. The road wound for miles through the hills, passing over some areas of a brilliant green stone we hadn't seen before, becoming cruder and cruder all the way. Finally, on one hill-top it stopped and was continued by a horse-trail which led over the crest of the Moa Range in the direction of Santiago.

We were unpleasantly surprised to find that the country back in the interior had been terribly devastated by fire. The primeval forest we had imagined on the Gran Tierra turned out to be an El Dorado. Webster hiked along the trail for a few kilometers, seeing mostly barren hillsides covered with grass and that tiresomely ubiquitous fern Pteridium aquilinum. Along the side of one peak, however, he found a few remnants of the original vegetation, including Casearia ophiticola, a small melastome with a wine-colored velvety hypanthium that turned out to be Calycogonium pauciflorum, and a Phyllanthus with bright pink flowers and leaves which were at first dark red, later becoming yellowish underneath. Müller Argoviensis had well named it Ph. erythrinus; it could also be named indomitus, since it was springing up luxuriantly from charred stumps.

On the way back to the coast, we stopped for a while on a high ridge at approximately the type locality of Phyllanthus chryseus, a striking species with revolute leaves which were bluish-green above and bright golden-yellow beneath. It had been described by Dr. R. A. Howard only four years previously. Associated with it were a number of other interesting pineland species, the most arresting of which was Scaevola Wrightii, which is restricted to Oriente and is the only endemic species in the New World of this principally Australasian genus. The development of Scaevola Wrightii presents an interesting parallel to the evolution of endemic scaevolas in the Hawaiian Islands. The similar parallel development of Dracaena has already been mentioned, and the presence of endemic genera of Malvaceae (Kokia and Hibiscadelphus in Hawaii, Atkinsia in Cuba, Ulbrichia in Hispaniola, and Montezuma in Puèrto Rico) is also suggestive. Apparently certain groups of plants, for reasons not yet understood, have a special tendency to insular endemism. The parallel development of superficially similar taxa may easily occur in widely-separated insular areas by natural selection, as is perhaps illustrated by the similar species of Plantago in New Zealand, Hawaii, Juan Fernandez, and St. Helena. The similarity of Acacia Bucheri to some African species may possibly be explained in this way, without resorting to the hypothesis of direct Antillean-African land connections.

Back at camp, Jervis and Webster returned to the port area for one last look, and Jervis discovered what seemed to be a patch of virgin pine forest in an old cemetery plot. After supper we went over to the boiler shed and got down the presses, which we had set up to dry just as Marie-Victorin and other visiting botanists had done. Back in the

guest house we worked until late ordering up the collections of plants, while a battery radio played wild Cuban music interspersed with outbursts of passionate oratory. As usual, there was also an audience of interested Cubans whom Smith interrogated about important hardwoods with remarkably effective use of sign language and gestures.

The next morning we got up to find it raining, and on this inauspicious note we said our goodbyes, filled up the tank of the jeep at the company gas pump, and left the Moa lumber camp for the last time. We felt much indebted to the officials of the lumber company for their generosity in receiving us without any previous warning and for the courtesies they extended during our visit. The rain had stopped by the time we came out on the plain near Cananova, so that we could take a good look back at these fascinating mountains of iron. To west, ahead of us, were the Sierra de Cristal and Sierra de Nipe, but we were fated not to reach them. We drove on to Mayarí, thence to Santiago, where we said goodbye to Smith, and then to Guantánamo Bay, where we recouped our forces for an excursion along the south shore of Oriente. Eventually, in the hilly region called Altos de Farola about 20 airline miles south of Baracoa, we found a number of the familiar Moa plants such as Scaevola Wrightii and Dracaena cubensis growing on similar serpentine ridges. The flora at Moa, then, extended at least in part clear across the eastern "snout" of Oriente, but we found no areas which furnished as rich collecting as that at the Rio Yagrumaje.

We had actually collected only five days in the Moa region, and had to be content with a superficial survey of the vegetation and flora. The lack of ecological information in this paper may perhaps be excused by the fact that we had almost no previous knowledge of the flora of the area. A serious ecological survey of the region would be of great interest, particularly from the standpoint of studying the adaptations of the serpentinicolous vegetation, as well as comparing the rain-forest of the Cayoguan valley with the typical lowland tropical rain-forest.

The Moa country is far from being the least-known area in Cuba, but the richness of the flora will make it a fascinating collecting ground for many years to come. Charles Wright, who collected extensively in Oriente from 1856 to 1867, visited Baracoa on the east and La Catalina (near Sagua de Tánamo) on the west, but never reached the Moa country proper. At Baracoa he did, however, collect many species described by Grisebach which have since been found to the west.

The first botanist to reach this part of Cuba was John A. Shafer, who collected extensively in Cuba for the New York Botanical Gardens in the years 1909 to 1911. He made two trips to the Moa area, first in February, 1910, and later in late December, 1910 and early January, 1911. He wrote short accounts of both trips (9, 10). Some of his

localities, from which many new species have been described, are given on the map accompanying Brother León's article on botanical explorations in Cuba (4). The intrepid Swedish botanist Ekman began his explorations in 1914 in the Sierra de Nipe and later explored the Sierra Cristal and the country west of Baracoa. He never reached the Moa vicinity proper, but again many new species described by Urban from his collections have since turned up in the Moa region. Juan T. Roig, an enthusiastic Cuban botanist, visited the region in the late summer of 1917 and wrote a short report which appeared in the same issue with León's article (8). Mr. and Mrs. George Bucher, who were hosts to botanists visiting the Moa lumber camp, themselves collected in the 1930's.

In 1941, Brother León, Brother Clemente, and Dr. R. A. Howard visited Moa, and Leon wrote a short article on the trip in the same year (5). In 1942 and 1943, León, Alain, Clemente, and Marie-Victorin collected extensively in this region as well as in the Sierra de Nipe. Alain published a short report on the collecting in Moa in 1946 (1), but the publication of Marie-Victorin's account of these travels, to be issued as the third volume of his "Itinéraires Botaniques dans l'îsle de Cuba", has been delayed because of his untimely death in 1944. The title of this paper has been suggested by what we understand is to be the title of his forthcoming book, namely, "Mountains of Iron". That publication, we trust, will cover this subject in far greater detail and scope than we have.

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Fig. 1. The village near the mines in the valley of the Rio Cayoguan, surrounded by tropical rain-forest.

Fig. 2. Charrascal vegetation dominated by Copernicia rigida and Sabal, near Playa de la Vaca.

# THE BULL OR PASTURE THISTLE: ALSO LETTERS ON A BIRCH HYBRID AND OTHER TOPICS

Clarence R. Hanes

IN 1933 when we began an intensive study of the flora of Kalamazoo County, Michigan, Cirsium vulgare (Savi) Tenore, the bull or pasture thistle was very rare. Its natural enemy, the butterfly Vanessa cardui (Pyrameis cardui), commonly known as the Painted Lady, had kept it in check by laying its eggs in the thistle heads. The larvae feed on the seeds and when very numerous they will soon shorten the crop. About 1938 a slow but steady increase in thistles was noticed. By 1942 they were becoming abundant again and the following year they had so multiplied that some fields around Schoolcraft were almost completely covered with them.

Since the bull thistle is a biennial, cutting the second year plants when coming into bloom usually destroys them. We had in 1942 a field of four and one-half acres that had been in permanent pasture for at least 10 years and was kept in this condition until the spring of 1951. The following is a record of the number of second-year plants cut during 1942 and consecutive years through 1950: 125, 1078, 2612, 1347, 1553, 204, 986, 446, and 355. In 1947 one-half of the field was mowed for hay. Hence the record of 204 plants is for little more than two acres.

During the past year, 1951, only a small reduction has been noted in the number of this plant in our community.

The bull thistle prefers a non-acid soil. The sweetening of the soil by the application of marl or lime, which has been a good farm practice for the past two decades, may have favored its present abundance and so upset nature's method of control.

Deam in his Flora of Indiana (1940) says, "As nearly as I can remember, about 25 years ago it (the bull thistle) began to disappear and in a few years it had practically disappeared." However, he states, "In 1938 I have noted more specimens than for many years."

Another thistle episode had its beginning on August 18, 1944, when aeroplanes from Fort Custer were operating in their sham battle maneuvers. The planes came nearly along US 131, flying from the north over the village of Schoolcraft. They flew at a very low altitude. That year, 1944, one-half mile north of the village, there was a 20 acre pasture field covered with bull thistles with millions of seeds ready to be set afloat. The planes, with possibly some help from northerly winds, spread so many of the seeds that a large part of the lawns and gardens was peppered with them.

Lawn mowing has been a sufficient deterrent to prevent many from reaching the second year stage. However, thistles have shown up each year. The actual count of the first year plants dug on our lawn in September and October, 1951, was 246, most of which, no doubt, came from the seed set adrift in 1944. This record shows that some of the seed of the bull thistle remains viable for at least seven years.

Schoolcraft, Mich.
Nov. 4, 1951.

Dear Professor Bartlett:-

I am sending a package with some seeds for your garden. Among them is the pawpaw. Also there is a specimen of X Betula Purpusii. This was collected at the same time as the one in our herbarium. Looking for specimens of another kind I came across this remnant. Another from this same collection is in the Gray Herbarium. That is why Fernald gives it for Michigan. Keep it.

Leaves of B. pumila are rarely more than 5-veined; those of B. lutea have nine or ten nerves or veins. The cross has five to seven. Serration of B. pumila is blunt and of B. lutea very sharp. The cross is midway of the two.

Sincerely yours,

Clarence R. Hanes

Schoolcraft, Mich.
Jan. 28, 1952.

Dear Professor Bartlett:-

I am glad you are making headway with the Asa Gray Bulletin. Some difficulties are to be expected with the launching of a new publication. Dr. Bailey's reminiscences will be interesting as he is probably the only living botanist who was associated with Gray.

If you lack for material I might write an item about different trees that can yield some type of syrup. Besides the rock and the black maples we have made syrup from the walnut, birch, and hickory. There are several interesting things we have observed about the syrup from the hickory. We have tried the sycamore but without any success.

Stop in any time for lunch or dinner. Mrs. Hanes says she can scrape up something. Best wishes for the magazine venture.

Sincerely yours,

Clarence R. Hanes.

# CHARLES C. DEAM HONORED BY HIS TOWNSMEN OF BLUFFTON, INDIANA

ON February 11, 1952, the Bluffton (Indiana) News-Banner carried the following article regarding our good friend, Mr. C. C. Deam:

## Portrait of Dr. Chas. C. Deam to be Unveiled by Lions Club

Dr. Charles C. Deam, world-renowned botanist and conservationist and lifelong resident of Bluffton and vicinity, will be honored by the Bluffton Lions Club at a dinner Tuesday evening, Feb. 19. Following the dinner, members of the Lions Club and their wives and conservation notables from over the state will attend the unveiling of a portrait and plaques honoring Dr. Deam at the county court house.

The portrait and plaques are to be erected by the Lions Club on the second floor of the court house facing the main entrance.

Principal speaker at the dinner meeting will be Kay Kunkel, native of Bluffton, head of the Indiana Conservation Department.

Although confined to his home at intervals recently because of illness Dr. Deam is still active in writing and revising his earlier book, Trees of Indiana, and occasionally visits the business district.

He was born on a farm east of Bluffton on Aug. 30, 1865, and spent his early life on the farm. He first entered the drug business in Bluffton on May 3, 1891, after working for several years both as a surveying engineer and drug clerk at Marion and Kokomo. Following the death of James R. Spivey, who had been his partner in the drug business here, Don V. Harris became a partner and the drug store is still operating under the name of Deam & Harris.

APPOINTED FORESTER. In 1909 Mr. Deam was appointed by Gov. Thomas R. Marshall as State Forester of Indiana and served in that capacity until 1913. He became Acting State Forester in 1917 and 1918, and again State Forester from 1919 to 1928, heading the Department of Conservation. Beginning in 1929 he was engaged in research work in forestry for Indiana, a position he held until he resigned in 1940.

A graduate of DePauw University . . . Dr. Deam was presented in 1920 with an honorary A. M. degree from Wabash College. In 1932, DePauw presented an honorary Sc. D. degree and Indiana University bestowed an honorary LL.D. in 1939.

## Pugsley Award

The American Scenic and Historical Preservation society presented the Pugsley silver medal award to Dr. Deam in 1938. He became the second Hoosier so recognized by the society.

A past president of the Indiana Academy of Science, Dr. Deam is a member of the American Association for the Advancement of Science, the American and British Ecological societies and the Society of American Foresters. At the present time he has more than 500 specimens of trees and shrubs growing in his arboretum adjacent to his home. As a collector Dr. Deam gathered more than 65,000 specimens of plant life and some years ago he presented the collection to Indiana University, where it forms the Deam Herbarium.* In addition the university has his 3,500 bound volumes and numerous pamphlets and reprints which comprise Dr. Deam's botanical library.

DEAM'S OAK. Dr. Deam's name is associated with "Deam's Oak" a natural cross between a chinquipin [oak] and a white oak. This tree is located on a state-owned plat of ground northwest of Bluffton on state road 116. The location is given on all maps published by the state highway department. The land on which the tree is growing was purchased by Dr. Deam when the tree was in danger of being cut. Dr. Deam then donated the land to the state, thus insuring permanent protection for the species. Nearly every large university in the nation has seedling trees started from the hybrid.

Our correspondent unfortunately failed to send the copy of the "News-Banner" with the actual report of the ceremony at the unveiling of the portrait, and Mr. Deam's remarks on that occasion, but in a subsequent issue (that of Feb. 27) Mr. Deam expressed his appreciation in a letter which his associates and correspondents will find characteristic, indicating that in spite of advancing years Mr. Deam retains his old-time vigor of expression. We shall let him speak for himself by quoting the letter:

Editor
News-Banner

Your letter of recent date acknowledging receipt of my letter is greatly appreciated and is filed in my box of mementos. I again

*That part of Mr. Deam's herbarium which had no bearing on the Indiana flora is at the University of Michigan. It includes his early and important collections from Guatemala and Mexico, and states not bordering on Indiana. The Michigan Herbarium also contains an excellent selection of his earlier Indiana material, sent prior to 1915 to the writer of this footnote. — H. H. B.

X Quercus Deamii Trelease, near Bluffton, Indiana: the second tree from the left. This photograph of the original Deam Oak was taken in 1940, by Frank N. Wallace.

wish to thank you for the very generous write-up in your paper. The favor and honor are appreciated more than words in this letter can express.

Facts are that I was born with a good memory and have lived a long time, and worked constantly. In my drug store and in my forestry work I have faced the public for 60 years. Pyramiding my small achievements has isolated me somewhat from the "mine-run", although that is my class.

I was plebeian born and plebeian reared, but always a conservationist. I have never liked the term "conservation" until I saw it defined by Prof. Emanuel Fritz in the January number of the Journal of Forestry. I ask you to pardon me for quoting a part of his definition. "Conservation to be meaningful must be looked upon as a wise use; frugality, and use without waste." That is, it starts with the individual's wise use of his own resources, time, effort, and money. I think I have complied with his definition.

I have a phobia against athletics. Thousands of hours are wasted by spectators attending athletic games. O. K., if there is no alternative, but there is. Please note the great number of newspapers, magazines and books to be had.

A recent Gallup poll showed that 34 per cent of the high school students did not know how many U. S. senators each state had, and 16 per cent could not tell how many three-cent stamps one could buy with 75 cents. I admit that many high school and college students are "sent" there. This reminds me of a quip I read recently in the newspaper which bears this out. A young lady was interrogated on the subject and she replied that she went to college "to be went with, and I ain't."

It really pains me to see our school children "put on the loose" in May. Only last evening I was discussing this subject with a mother of three girls in school, who is a graduate of Indiana University, and when I told her I was in favor of a six-day-a-week school, etc., she spoke up emphatically that she "wanted her girls, ages eight, nine and twelve, at home on a Saturday."

Russia, our greatest enemy, has a six-day school week and a 11-month school year. Their example is worth considering. Yes, I am aware we have $8,600 for recreation in Bluffton. Many years ago while Frank Myers was here as school principal I tried to get the schools interested in school gardens with Frank as teacher. It came to naught.

Let's do teamwork until nature separates us.

Sincerely,

Charles C. Deam

# VEGETATION OF ULLUNG DO, KOREA

In-Cho Chung

ULLUNG DO, or Dagelet Island, is a small island in the Japan Sea. Pohang, South Korea, is the nearest port from which one may leave for the island, and it used to take about half a day by local steamer to reach Do-Dong at the southeast end of the island. Do-Dong is the only harbor of the island for small boats, and is surrounded by cliffs about 100 m. high. Almost all of the island shore is abrupt.

Ullung Do is an old volcano, pentagonal in outline and about 60 km. in circumference. There are in the center three small mountains, 850 to 920 m. high, surrounding an upland which is the only part of the island suitable for crops.

The climate is mild and precipitation is high, with heavy rainfall in June and July and moderate snowfall in winter.

Although plants of the Korean main-land and some islands in the Japan Sea off the south coast of Korea, including Cheju Do (Isl. Quelpaert), were collected and studied by Europeans at the end of the nineteenth century, plants of Ullung Do were unknown to science until about 1916 when Japanese forest officials explored the island.

Dr. T. Nakai, former professor of systematic botany of the (Imperial) University of Tokyo, now Director of the Science Museum of Tokyo, botanized on the island in 1917 and published the "Report on the vegetation of the island Ooryongto or Dagelet Island, Corea" in 1919. Only the title is English: the text of the article is Japanese. Dr. E. H. Wilson would seem to have been the only Occidental botanist who had visited the island down to 1917, when he was there in company with Dr. Nakai. His plants are preserved at the Arnold Arboretum of Harvard University. Dr. Wilson was an enthusiastic photographer and it may be presumed that his extensive collection of pictures of Oriental vegetation, likewise at the Arnold Arboretum, may include some from our island. Plants of the island collected by Dr. Nakai are preserved in the herbarium of the University of Tokyo; those collected in 1947 by Mr. P. S. To, former president of the Seoul College of Pharmacy and co-author of the flora of Seoul* , are in his private harbarium. Plant specimens of Ullung Do collected by the writer in 1948 and those by Mr. Y. S. Oh in 1949 are in the Herbarium of the University of Michigan. These two later collections may be the most extensive, unless exceeded by those of Dr. Nakai.

*This publication has the following title: Ishidoya T. and P. S. To, Florula Seoulensis. Journ. Chosen Nat. Hist. Soc. 14: 1-48. 1932.

Formerly the island was thickly forested from sea level up, but most of the accessible timber has been taken to Japan. About 30 species of ferns and about 350 species of flowering plants have been reported, of which approximately 10 per cent are supposed to be endemic.

On the shores and foothills there are found such broad-leaved evergreens as Machilus Thunbergii, Litsea glauca, Ilex integra, Daphniphyllum macropodum and Camellia japonica, which are not found in the Korean main land except on its southernmost coast and on Quelpaert Island. Ardisia japonica, Pyrola renifolia, Pyrola japonica and Mitchella undulata are under those evergreens. At Hyon-Po, on the north west coast of the island, there is a grove of Camellia japonica along the shore, where the trees are all wind-trained. Strong and persistent wind pressure has bent the branches on the windward side so that they point permanently in a leeward direction. Characteristic shore plants in sandy soils are Tournefortia sibirica, Calystegia Coldanella, Lithospermum officinale Murasaki, Scrophularia Grayana, and Lysimachia mauritina. Broussonetia papyrifera is shrubby on exposed foothills, but grows successfully to tall trees in the valleys. Tsuga Sieboldii on the foothills and Pinus Mayri on the middle of the mountains are common to Japan, but are not found elsewhere in Korea. From the middle up there grow Prunus takesimensis, Alnus Maximowiczii, Fagus multinervis, Tilia insularis, Sorbus commixta, Acer takesimense and Rhododendron brachycarpum. Euonymus Fortunei radicans, Hydrangea petiolaris and Schizophragma hydrangeoides are climbers on those tree trunks.

Fagus multinervis Nakai is one of the endemic trees, and is very close to F. japonica Maxim., differing from it chiefly by the thicker pedicels of the staminate flowers. I wonder whether or not such minor character of Fagus would be subject to the environment as some species of Potentilla transplanted to the Stanford Garden from higher elevations have shown the similar variation of thicker pedicels and more prominent pubescence than in their original habitat. In any event, the distinction would seem to be hardly of specific importance, even though worthy of systematic recognition until trees from different habitats can be grown side by side. It might better be considered a variety of Fagus japonica. On the middle of the mountains, under Prunus takesimensis and other woody species, we found Lilium Hansonii in rich humus. This species is quite popular in Japanese gardens as the 'Takeshima-yuri'. Doubtless this lily was carried to Japan by old Japanese voyagers and named after this island. This well-known lily has two or three whorls of leaves and several orange-yellow, spotted, nodding flowers which are very fragrant. It has not been found wild elsewhere in Korea, but also grows, as told by E. H. Wilson in his book "The lilies of eastern Asia, a monograph" (1925), on the shores of Victoria Bay near Vladivostock.

Hepatica maxima Nakai is one of the endemic herbs quite common in the woods. This is quite different from the main-land species, H. triloba, in its large leaves and flowers, in its densely pilose petioles and scapes and in its glabrous ovaries and fruits. Recently Mr. Oh collected three plants of Hepatica on Hong Do, a small island off south coast of Korea, one of which is like the main-land species and the others are intermediate in leaf size between the main-land species and H. maxima of Ullung Do. It is our great regret that no seeds nor flowers are found in those three specimens. Transplant experiments and cytological studies would be desirable to find out their actual genetic relationships.

Abelia insularis and Opulaster (Physocarpus) insularis are small endemic shrubs in crevices of rocks at the top of a small hill near Do-Dong. The exposed rocks are more or less completely covered by Polypodium vulgare or Cyclophorus linearifolius. Pinus densiflora, P. Mayri, Tsuga Sieboldii and Juniperus chinensis are usually found as small trees among rocks on mountains near the shore.

An interesting feature is large colonies of Allium victoriale and Maianthemum dilatatum under deciduous trees and shrubs such as Acer takesimense, Sorbus commixta, Aralia elata, et al., on the northern slope of a small mountain, Sang-Bong. In such shade are also found such ferns as Dryopteris crassirhizoma, D. Miqueliana, D. lacera and Adiantum pedatum. However, Asplenium Scolopendrium, Matteucia orientalis and Rhumora Standishii are found in the moist and shady valley of Namyang-Dong.

About 16 species were found either by Mr. Oh or by myself that are not reported in Nakai's publication. The most notable of those are the following:

Houttuynia cordata Thunb. Do-Dong (Kukyu Lim)
This is quite common in Japan, but not found in Korean main land.

Clintonia sp. Sung-In-Bong
Our specimens are without flowers; leaves are thinner than those of C. udensis and with 3—7 prominent veins besides the fine nerves.

Disporum smilacinum A. Gray

Perularia ussuriensis Schltr.

Amitostiga gracilis Schltr.

Liparis Makinoana Schltr.

Spiranthes sinensis Ames

Ranunculus Vernyi Fr. et Sav. var. japonica Nakai

Wasabia japonica Matsumura In a springy place between Taeha and Hyonpo.

Astilbe sp. Namyang-Dong
This resembles A. Thunbergii in general appearance, but the pistillate plants have 3(-4)-carpellate flowers and the staminate plants have 20-androus flowers.

Deutzia sp. Do-Dong (Kukyu Lim)
This is close to D. paniculata, but leaves are stellate-pubescent on both sides.

Euonymus alata Sieb. and E. alata Sieb. var. subtriflora Fr. et Sav.
Namyang-Dong, Rali-Dong and Sun-In-Bong.

Phryma leptostachya L.

Codonopsis lanceolata Trautv. Rali-Dong

Platycodon glaucum Nakai Rali-Dong

Monotropa Hypopithys L. var. japonica Fr. et Sav.

Mr. Oh, my collaborator in collecting on Ullung Do, was a student of botany at the Normal College of Seoul National University. I have not heard from him since 1950 and his present whereabouts and occupation are unknown.

Figure 1

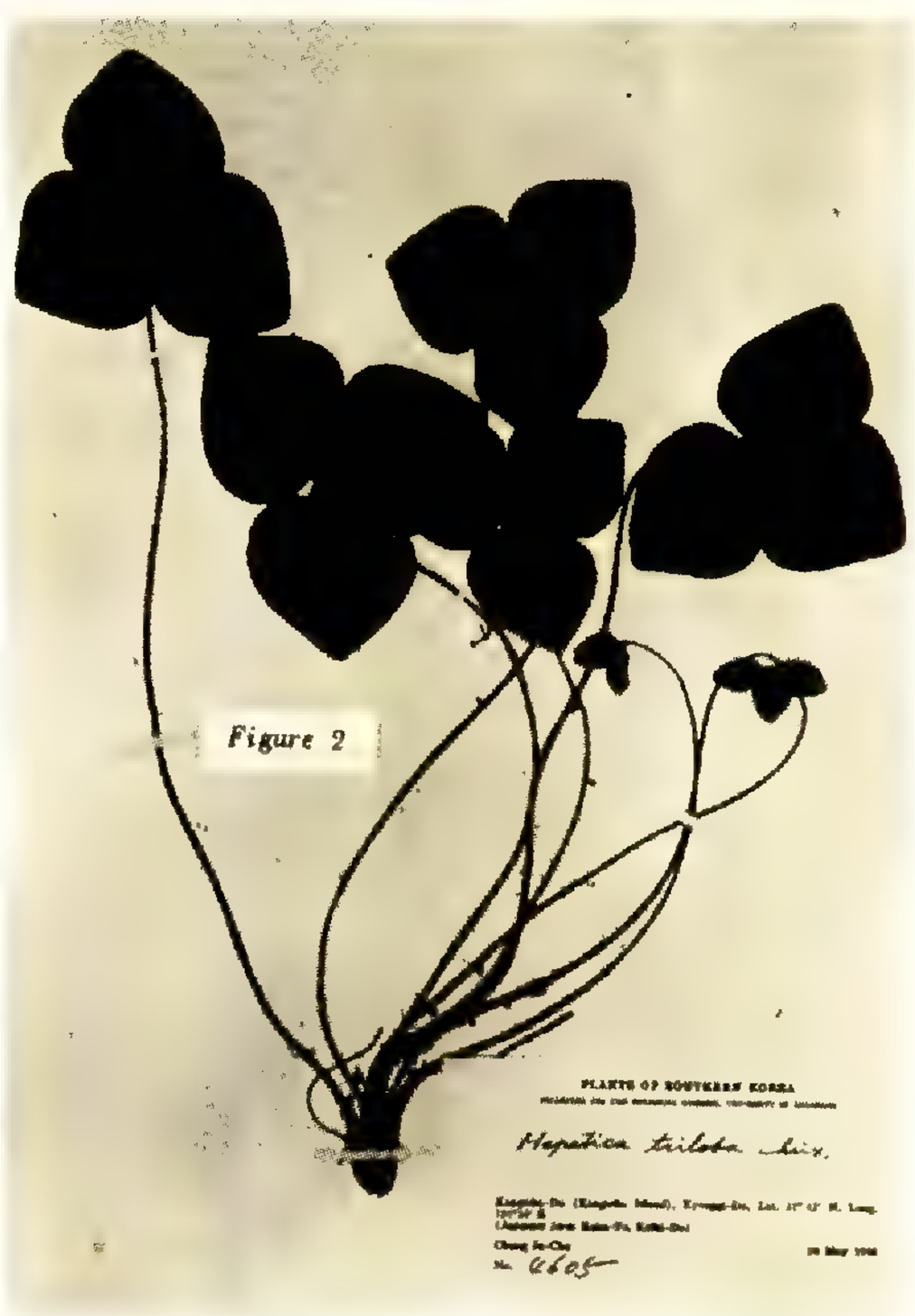



Figure 2

Fig. 1. Hepatica maxima Nakai, an endemic of Ullung Do.

Fig. 2. Hepatica triloba L. This is the form which is found on the mainland, but also on Kangwha Do, where the plant shown was collected.

# A PALEOBOTANICAL EXCURSION IN NORTHERN ALASKA

Chester A. Arnold

NAVAL Petroleum Reserve No. 4, which occupies northern Alaska between the Brooks Range and the Arctic Ocean, is an area a little smaller than Indiana. The Colville River forms its eastern and most of its southern boundary, and its northern limit is the ocean beach. Its southern half lies within the Arctic Plateau, a rolling terrain with elevations ranging between 600 and 6000 feet that is cut up by streams fed by drainage from the Brooks Range. At its northern edge the plateau levels off onto the Arctic Plain that is practically featureless except for thousands of lakes and ponds and sluggish meandering streams that look as if they flow nowhere. Human habitations are limited to two or three small coastal villages such as Barrow and Wainwright, several oil-well drilling camps of temporary duration, and a few scattered settlements at the foot of the Brooks Range on some of the larger streams. If the large Eskimo village of Barrow, which owes its present size mostly to employment opportunities offered by Arctic Contractors, were left out of consideration, the whole human population of the vast area could probably be counted by hundreds rather than thousands.

Travel within Naval Petroleum Reserve No. 4 is restricted to those who have special permission to enter it. However, even were there no arbitrarily imposed restrictions, the region is not readily accessible because of the absence of roadways or scheduled airline flights. Only one or two boats ply the north coast during the summer and call at the villages. The only means of getting around within the reserve during the summer is by bush plane. It is even difficult to explore one's immediate surroundings because the tundra is too soft for easy walking. Going over it is like treading on a thick innerspring mattress. A one mile hike is a strenuous, fatiguing experience, and after my first venture out onto the tundra I appreciated as never before the solid footing on our western plains. The situation is different in the winter when the surface is frozen, and then long trips by dog sled or "cat" train can be made. That is why the Eskimos can do most of their traveling in the winter.

The entire reserve is underlain by permafrost, the term for permanently frozen ground. The permafrost is amazingly deep, 1800 feet in places. During the short summers a surface layer thaws to a depth of one or two feet. This layer, the "active layer", as it is called, is not true soil at most places, but a partially decomposed peaty substance that supports a copious growth of lichens, mosses, dwarf birches and

Arctic willows, and other tundra plants. It holds water like a sponge, and on level ground the tracks made by motor vehicles immediately fill with water. Special problems have to be coped with when constructing buildings on the permanently frozen ground. If the building is heated, the ground underneath will thaw, causing concrete floors to settle unevenly and the whole building to become lopsided. Sometimes pockets of supercooled but unsolidified water held under great pressure beneath the ground are released by thawing, thus producing geysers that flood the buildings. A building may become filled within a matter of minutes, and when the temperature outside is low (-40 degrees F.), the water freezes and transforms the interior of the building into a block of solid ice.

The Arctic Plain is cooled during the summer by prevailing winds off the Arctic Ocean which carry an almost continuous layer of clouds that often drifts along on the ground. The annual rainfall is light, — four inches or so, and were it not for the low temperatures and lack of drainage the country would be as dry as the Great Basin. Because of the cold and cloudiness a light mist falls much of the time, and clear days are few. Farther south, on the Arctic Plateau, there is more rain but also more clear weather. Although the summer temperature at Point Barrow seldom goes above 60 degrees F., one occasionally experiences 80-degree weather on the Colville River 200 miles inland. There the humidity is high, probably about 80% and the heat becomes oppressive. It would not be so disagreeable if one could dispense with his heavy clothing which is almost as essential for protection against mosquitoes as for warmth on cooler days. Such warmth, however, seldom lasts long. The first cloud that drifts over the sun sends the temperature tumbling 20 degrees or more in only a few minutes and one's coat must always be within reach. These sudden temperature drops may bring on mist or fog.

Extending as it does from 150 to 350 miles beyond the Arctic Circle, most of the reserve is bathed in continuous daylight throughout part of June, all of July, and part of August. I have been asked whether one can sleep in the constant daylight, and whether one ever uses the clock. My answer to both queries is yes. One soon finds that the steady daylight does not eliminate the need for sleep, and that one sleeps regardless of where he is once he becomes tired enough. The strenuous exercise of walking on the tundra is quite conducive to sleep after a few hours. The first "night" out on the tundra is not always especially restful, but it is usually the noisy birds as much as lack of darkness that keeps one awake. Also, fresh grizzly bear tracks, which are often seen, do not increase one's ability to relax. As for ignoring the clock, I found the habit I had been practicing for about 50 years of going to bed with fair regularity was not easily broken. After 16 hours or so of activity, I was ready to turn in, just as I would be in Ann Arbor.

Even though the sun swings in a great circle around the horizon

day after day, there is a noticeable increase in the activity of nocturnal animals, and the water-fowl begin to search for nesting places, when the sun enters upon the northern half of its daily journey. Because of the continuous daylight, temperature changes other than those brought on by cloudiness are slight during the 24-hour period. If the sky is clear, it is almost as warm at 2 a.m. as at noon, and the morning freshness to which one is accustomed at home is mysteriously lacking. Our Arctic sleeping bags were sometimes too warm for comfort.

A common and widespread notion about the Arctic is that it is inhospitable to life. This is most erroneous. Every inch of the tundra surface, except bare rock, is padded with growing things. Neither is it inimical to animal life. It seems to furnish a congenial (too congenial, in fact!) habitat for the mosquito, and is the nesting place for numerous birds. Large mammals, the moose, caribou, grizzly bear, wolf, and fox find that they can compete more successfully here against a rigorous climate than against man in the surroundings of his choice. Another fact that one seldom considers is that conifers, which thrive in cool climates, do not extend as far into the north as the angiosperms which, with their almost endless ability to diversify, have established themselves and can hold out right on the Arctic shores. The gymnosperms are the only class of plants that does not exist in any form in the distant north. Although ferns are scarce, all major plant groups except gymnosperms are firmly established there.

An opportunity to do paleobotanical work in the Arctic was something I had long hoped for, so when the Director of the Arctic Research Laboratory at Point Barrow suggested to me late in 1950 that I present the matter to the Office of Naval Research, I immediately got busy.

The plan, as it was finally approved by the Office of Naval Research, was for a party of three to spend July and August of 1951 in the reserve, a place I otherwise would probably never see. During the spring months preceding the trip, much time and effort was devoted to finding out as much as possible about the country into which we were going. Although I could get little information concerning where fossils occur in the reserve, there was evidence that they could be found if someone made a systematic search for them. Rumors came of an unidentified Eskimo who had seen "pictures" of plants in the rocks at Shull Cliff southwest of Barrow. The Eskimos have a coal mine on the Meade River, and coal is known to occur quite widely throughout the reserve. Wherever there is coal the chances of finding fossils are good. Moreover, earlier geological parties exploring Alaska had reported a few fossils along the Colville River and other streams north of the Brooks Range. But I was not able to get much specific information on the occurrence of fossils, and the trip would be mostly for reconnaissance.

Our party, consisting of Dick Scott, Stewart Lowther, and myself, arrived in Fairbanks on July 1.

At the world's northernmost university, the University of Alaska, we saw a valiant effort against considerable odds to make higher education available to the youth of the remote scattered settlements of the far north. Alaska, not being a state, lacks authority to levy property taxes. Because of the small enrollment at the university, the federal government is not liberal in supplying the institution with funds although, paradoxically, many prospective students have to be turned away each year because of inadequate instructional facilities. The institution is thus the victim of a vicious circle of circumstances. Nevertheless, the struggling university puts up a bold front. It has a football team, and a stadium, the Ice Bowl, in which a game is played on New Year's Day if the temperature is not below -10 degrees F. One condition is that that there must be snow on the ground, which is always more than a mere probability.

Although summer school was in session when we were there, we saw little activity. Office doors were open but very few faculty people could be found. The finest building on the campus is the Geophysical Institute. The girls have a new dormitory which, judging from the number of windows, accommodates about 60 occupants. In front of the men's hostel were cars from Texas, Illinois, California, and other states. We learned that the place is turned into a tourists' hotel during the summer to help take care of visitors who come to Fairbanks via the Alaskan highway.

On the morning of July 3 we took the "linehaul" for the three and one-half hour, 600 mile flight from Fairbanks to Point Barrow. The twin-motor plane had seats along the right side for passengers, and on the other side was a cargo of mail sacks, baggage, a crate of eggs, a box of fresh lettuce, several drums of oil, and other articles all tied down with a rope net.

First we crossed the Yukon River, then the Brooks Range, then the Colville River, and then it wasn't long before we were over the wide, flat, half-land, half-water Arctic Plain. It looked like a different world, an unreal one. Over the tundra we saw that unique phenomenon the "patterned ground". The ground is plainly marked off into squares and polygons from 20 to 60 feet across, and sometimes the pattern exactly resembles the street plan of a razed village. The pattern is not so much in evidence to one on the ground but the number of ditches seems unusual, especially as they do not serve for drainage. They are sometimes six feet wide and four feet deep, although most of them are smaller. The cause of this striking phenomenon of the tundra is revealed by digging down a few inches. Underneath the ditch is solid ice which extends downward for several feet in the form of a wedge. These wedges form a network that produces the pattern seen from the air.

After crossing more than a hundred miles of patterned and lake-

dotted tundra, the ice of the Arctic Ocean loomed ahead, and below, on the narrow beach that separates the tundra from the water were the quonset huts of the Arctic Contractors' work camp at Point Barrow. Off to the left, four miles away, was the cluster of houses making up Barrow village.

When the plane landed at the Point Barrow airstrip, we were met by Harry Balvin, assistant to the Director of the Arctic Research Laboratory. After introductions had been exchanged our baggage was loaded into a jeep for the half-mile ride to the laboratory. We stopped there only long enough to unload, because we were due at the "chow house". One's first visit to this institution is an event. Any apprehensions about shortage of food in the Arctic were soon dispelled. The food was handed out cafeteria style. We had large aluminum trays divided into compartments, and there were no dishes except bowls for soup. Right at the start two huge pork steaks fell onto my tray and a third one was coming as I moved my tray along to the next place. Then came two large baked potatoes, green peas, beets, vegetable salad (the ingredients of which had been flown from California), and a wide choice of sauces and relishes. At the end of the counter was thick apple pie, and coffee in big, heavy, handleless mugs. Then there was a bushel container of big bread slices (the home-made kind) and a liberal supply of butter (the real stuff) on each table. There were vitamin pills too, for anyone who thought he needed them.

Arctic Contractors' is a civilian corporation that drills for oil under naval supervision in the reserve. The camp, in which the laboratory is located, consists of about 200 quonset huts arranged along two principal "streets" along the shore of the ocean. These streets, which are paved with loose beach gravel, are half a mile or so long. The paving doesn't pack well and is difficult stuff to walk on, but the unstable condition of the frozen ground underneath makes hard paving unfeasible. The only firm surface anywhere around the place is the airstrip which is covered with heavy iron grating that makes a serviceable though bumpy landing surface.

The Arctic Research Laboratory is supported by the Office of Naval Research and administered by Johns Hopkins University. Arctic Contractors', however, supplies most of the facilities such as transportation of personnel between Point Barrow and Fairbanks, lodging and messing, electricity, water, and general equipment such as suitable clothing, sleeping bags, etc. The visiting investigator becomes an integral part of the camp and subject to rules governing personnel. However, the restrictions are not severe, and one is not especially conscious of infringements on his freedom.

The quonset huts of the camp furnish living and eating quarters for several hundred laborers, maintenance shops for machinery, laundry and dry cleaning establishments, gymnasium, movie theater, and

hospital. The Arctic Research Laboratory consists of thre huts joined together. They house 17 laboratories for investigators, the director's office, library, garage for "weasels", work shop, photographic dark room, and sleeping quarters for investigators. Each laboratory has a sink with hot and cold running water, gas and compressed air, and electricity. For field work there are boats, tents, gasoline stoves, outboard motors, and other items of equipment. If something is needed that is not in stock, it is flown in from Seattle 2200 miles away. (Gustafson had to have dry ice! The natural Arctic cold wasn't quite right.)

There were about 40 investigators in the laboratory during the summer of 1951, engaged in various projects of biological and physical nature. Some of the projects pertained to archaeology, aquatic ecology, limnology, vitamins, life histories and habits of Arctic mammals, bird studies, permafrost problems, fresh water algae, mosses, biology of Marchantia, taxonomy of vascular plants, fish studies, and fossil plants. About 16 universities and scientific institutions were represented.

I had not counted on finding fossils in the wet, soggy, flat tundra near Barrow. The laboratory was merely to be our summer headquarters while in the north, and I knew that I would have to go inland some distance to find rock outcrops. So we decided to explore along the Colville River, using Umiat as the starting point for the first trip.

On Saturday, July 7, we loaded a tent, sleeping bags, collecting equipment, food for 10 days, and an 18 foot canvas boat into a shuttle plane, and went to Umiat. There we found a camp modeled somewhat after the one at Barrow except that it was smaller. Umiat is in the river valley surrounded by hills, a setting quite different from that at Barrow.

We stayed at Umiat a few days, and finally decided that the best plan would be to explore the high cliffs along the river between there and Sentinel Hill about 25 miles downstream. So after setting up our boat and giving it a preliminary tryout, we were ready to start on the afternoon of July 11. Arrangements were made to be picked up near Sentinel Hill the following week, and we took off. A sizable delegation was on hand for the departure. "Where's the champagne?" I heard someone ask as the boat slid into the lagoon. I replied, "Use mosquito dope." Shutters clicked and a movie camera buzzed. Stewart placed himself at the stern, Dick fixed himself a seat in the bow, and I took the oars. We had been a little apprehensive as to how things might go, an expedition of this kind being a new experience for us. Our canvas boat was carrying a 1500 pound burden, and we had unpleasant thoughts of becoming stranded on some mosquito infested island in the middle of the river without food or shelter. We expected to reach Gubic in a few days, but otherwise any encounters with human beings were

improbable. Having no keel the craft was a little difficult to steer, but otherwise it was quite maneuverable. Aided by the current of which the speed was 12 miles per hour at places, we made good progress right from the start.

We stopped several times during the afternoon to look for fossils, but found none. During the next three days we made about 15 miles, stopped frequently, caught some Arctic grayling, and camped each night in the willow thickets that covered the gravel bars between the channels. Good camping places were sometimes difficult to find. The tundra was too hummocky and the river bed too rocky, and our tent stakes would not hold firmly in loose sand. In the willow thickets the small trees furnished anchorage as well as protection from the wind. Several times during the summer we had to lug our gear several hundred feet to a good site.

The Colville River is a mile wide at places, and the shifting channels form a network of waterways that surround boulder-strewn islands. Because the permafrost does not extend beneath the river bed the islands support the largest vegetation in the region, and the willows sometimes grow 15 feet tall. Where the ground is not too rocky it is covered with a thick carpet of Equisetum arvense, the "grass" of the river bottoms. The tundra begins abruptly at the edge of the river bed where the permafrost begins. The largest plants on the tundra are alders and dwarf birches, the latter being low straggling shrubs with stems the size of a pencil and a foot or two long. A letter from Professor Bartlett forwarded to me at Umiat requested that I collect some dwarf birches for him, a request that was delightfully easy to comply with.

Below Umiat the left bank of the river was flanked with high bluffs that at some places rose 300 feet or more. The rock consists mostly of bentonitic shale with some seams of impure coal and layers of coarse conglomeritic sandstone. The shale absorbs water and be - comes highly plastic and sticky. As the surface thaws in early summer, large masses of mud become dislodged and slide down, accumulating in huge piles at the bottom. Many of these piles extend out into the water and have to be climbed over. The surface is extremely rough, reminiscent of lava flows, and not always firm enough to bear one's weight entirely. Although there seemed to be no danger of sinking completely into the mirey mess, the mud was about as difficult to remove from shoes and trousers as paint would be. As these mud slides were placed every few hundred feet, they were major obstacles to progress when walking along the river. It was seldom possible to go farther than a quarter or half a mile without having to return and get the boat. We saw places where the sliding mud had eroded deep gullies and sluiceways down the steep cliffs. Sometimes they were as neatly formed as if purposely designed. I much regretted not being able to take good photographs of these interesting but troublesome

mud slides, but it was never possible to view them from suitable vantage points. Then there were other places where the thawed earth would adhere longer to the steep cliffs, and then come sliding and tumbling down in streams of dry dirt and plunge over the lowermost ledges like waterfalls. Across the river from our last camping site on this trip, at a place where the cliffs were unusually high and steep, great masses of loosened earth would fall with a tremendous roar. During the last night there was an almost continuous rumbling. It seems hardly necessary to explain that with nature in such a tempestuous mood the middle of the river or the opposite bank was the safest place.

At noon on Saturday, July 11, we arrived at Gubic, a well-drilling camp about 15 miles below Umiat. Before leaving Umiat, we had arranged to have some of our gear flown to Gubic where we would pick it up. It had not arrived yet, but the camp foreman said we were welcome to wait there until it did. By this time we were ready for a rest anyhow, so we made ourselves comfortable in the guest hut and enjoyed the food which was equal in quality and quantity to that at the main camp at Point Barrow.

There was nothing at Gubic except the enclosed derrick that stood up like a beacon in the wide valley, and quonset huts and wanigans for the crew. The weather turned very warm, too warm for comfort in the huts, but the mosquitoes made life miserable outside. On Sunday afternoon, while awaiting the arrival of our gear, exciting news was received. When the plane took off from Umiat it had crashed and burned, — loss complete. Fortunately the pilot and the one passenger extricated themselves from the wreck and escaped uninjured. We took stock of our situation and found that we had lost half of our food supply, 20 gallons of gas for the outboard motor we had expected to use, our parkas, and some other heavy clothing. The cook said he would replenish our food stock, and the weather so far had been much too warm for the extra clothing. We had also decided that the outboard motor was not needed. So we decided to go on the next day, and did.

As our craft began to drift downstream with the current the next morning, I experienced the peculiar feeling that we were going right into the unknown. As far as we knew, there were no human beings except three of us in an open canvas boat between Gubic and the Arctic Ocean a hundred and fifty miles away. Without the outboard we knew that we could not propel our craft upstream, and there was nothing to do but let the current take us where it would. But after some reflection I realized that that is the way life is. One faces the unknown every day of his existence: it is something that cannot be avoided. However, my thoughts soon turned to other things because three miles downstream, where the river bends to the right, a high bluff loomed in sight. When we reached it we found a good camping place among the willows with easy access to the cliff. A long stretch of the cliff was free of mud slides and dirt falls so it looked here as if a thorough search might be possible.

After staking the tent down firmly we picked up hammers and bags and started for the cliff. Immediately we saw fresh bear tracks in the mud. Then all at once Stewart let out a yell. It wasn't a bear, but a loose rock he had struck was full of fossil plants. The rock, which was about the size of a desk top and a foot and a half thick, was a mass of foliage, twigs, and cones. Here were the remains of an ancient Sequoia forest. Among the Sequoia fossils were a few dicot leaves, some other conifers that looked like yews, some ginkgos, and other plants we could not identify offhand. We had no up-to-date geologic map of the part of Alaska we were in, but I have learned later that we were collecting from the Prince Creek formation of the Upper Cretaceous. This particular rock had rolled down the cliff. Dick located the stratum from which it came high above the river bed not far below the tundra surface, but we found all the fossils we could collect in the rock that had come down.

On the afternoon of the next day we reluctantly broke camp because we wanted to go farther down the river before returning to Umiat, and some time must be left for collecting should more fossils be found. We found but few more, however, and on July 19 returned to Point Barrow where we displayed our collection before the laboratory crowd. These were the first fossil plants from northern Alaska that most of them had ever seen.

It was eleven days before we could get out again, because transportation facilities were not equal to demands and the weather was not good. But on the evening of July 30 we loaded our gear onto two small planes for a second trip to the river.

As the starting point for this trip I had chosen a spot on the map about 130 miles above Umiat. We were taken to a gravel bar below the mouth of the Etivluk River where our gear was unloaded. Had we possessed all the information of a guide book our choice could not have been a better one. Upstream the valley was wide with no extensive rock exposures in sight. But downstream, within a mile of our camping spot, a series of hairpin turns began with high cliffs at each bend. We found plants at the second place where we stopped the next morning, and a seam of pure black coal about ten feet thick extended the length of the mile-long cliff. We saw many such coal seams during the following week, coal that would be useful if it could be mined and transported. It would be possible for "cat" trains to reach the river in winter, but the haul would be too long to make mining there a profitable venture. Nevertheless, the coal reserves in Alaska north of the Brooks Range are large, and a hundred years from now, after more of the presently available coal is gone, the possibilities of coal mining there may be seriously investigated. Probably the best method of utilizing coal in such out-of-the-way places would be the gasification process wherein the coal is burned underground and the gasses either bottled on the spot or piped away.

Although fossils were nowhere as abundant as at that one spot below Gubic, we found them at many places. The rocks were harder and we encountered no mud slides or dirt falls. Consequently, collecting could be done more easily. We were in a different geological formation, the Chandler formation of the Lower Cretaceous. We found more leaves and cones of Sequoia and more yew-like conifers. Then there were deeply cut Ginkgo leaves and fronds of ferns and cycads. One of the most abundant plants was the extinct genus Podozamites, a plant of uncertain affinities but suspected by some botanists to be an ancient relative of the podocarps. Only occasionally did we find a fragment of a dicot leaf and at fully half of the places we saw none at all. Chunks of silicified wood were found frequently.

There are very few place names in northern Alaska that collectors can cite in recording localities. Most of the larger streams bear names, and if one has modern maps it is not difficult as a rule to know within a quarter of a mile where one is. Almost the only way to record a locality as part of a permanent record is to mark the places on a map and then publish a sketch of the map. It is sometimes possible to give degrees and minutes of latitude and longitude, but I discovered that on the three maps I had, no two showed the meridians at exactly the same place. They varied as much as 10 miles.

On this particular trip I had to invent a few place names where we found fossils. One place on the Colville River is "Roaring Cliff". It is a spectacular bluff at least 500 feet high and at least a mile long that flanks the third hairpin curve we passed on August 1. The name was suggested to me by a heavy roar resembling that of a waterfall that is caused by the wind along the craggy rim. Then that night we camped about midway around a prominent loop in the river that I call the "Big Bend". At that place the river sweeps around a curve that circumscribes almost two-thirds of a circle, changing its direction from east to westerly.

At the Big Bend low cliffs of shale and sandstone with several coal seams extend the entire distance of more than two miles. It turned out to be one of the best collecting places of the summer. Here we established camp, fortunately on a high and dry spot because during the first night it began to rain. A steady drizzle kept up all night and the next forenoon, and by afternoon it became a downpour. The tent leaked. The rain let up during the second night but the next morning the sky still resembled lead. Confinement in a small tent under such circumstances is frustrating in the extreme, so at 10 o'clock I ventured out into the thick mist to do some local exploring. I started alone, but within five minutes Dick and Stewart were close behind. Here we found that the river bank for at least two miles was littered with highly fossiliferous rock that had fallen from the low cliffs. Quite unbeknown to any of us, we had been stranded right beside one of the best collecting places along the river, and had the rain not halted us,

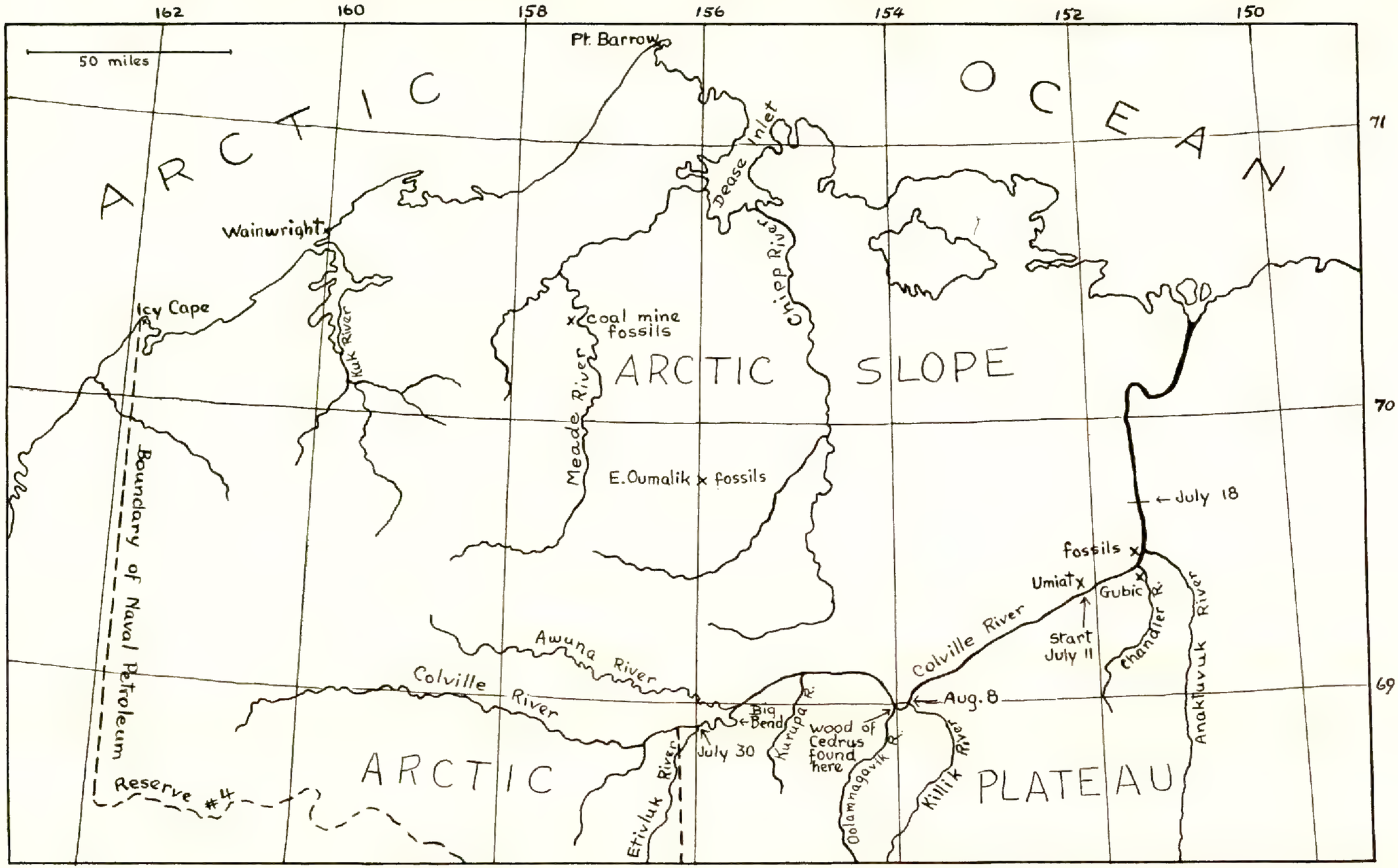
we might have drifted right past much of it. By mid-afternoon we had filled our bags and had about all the fossils we could handle. The rain had ceased so we broke camp and started down the river again.

We passed the Awuna River which I had wished very much to explore because of reports of silicified logs a few miles above its mouth. However, there were no suitable landing places along its course so we had to pass it by. We then entered a comparatively long straight stretch of the Colville along which good rock exposures are sometimes miles apart. We stopped several times during the next three days and found some fossils, but not as many as at the Big Bend. At one place in particular, the plants were clearly impressed in shale having a rusty red color. No traces of organic matter remained, so it was evident that the whole formation had been burned. A coal seam had probably become ignited, baking the shale and everything in it. An ashy dust arose as we climbed along the cliff.

We reached the mouth of the Killik River, where we had made previous arrangements to be picked up, two days ahead of schedule, having made good progress all the way in spite of the rain. I calculated that we had come 85 miles since starting out near the mouth of the Etivluk River eight days before. We were forced to camp 200 yards or more back from the river because the ground was too rocky closer to the water to drive tent stakes.

It was here we began to realize that our food was running out. There would be enough if the planes would come for us as scheduled, but we could not depend on them; in fact the chances were about even that we would have to wait a few extra days, maybe even a week if a siege of bad weather should happen to descend upon Point Barrow and keep the planes grounded. We figured that by careful rationing of the remaining stocks we could eat for three more days, but after that something drastic would have to be done. Umiat was about 75 miles ahead, and we believed we could reach it in 24 hours by traveling steadily, but the thought of rowing the boat that far on empty stomachs was dismal.

The next morning when I was down at the river's edge, I was shocked into a state of near insensibility for an instant by a sharp piercing bark behind me. There, not 200 yards away, was the Arctic wolf, vociferously challenging our presence within his realm. Apparently he was as surprised as I. My immediate reaction toward the rude beast was intense resentment, but when my pulse subsided a bit he began to be fascinating. I had never encountered a wolf in the wide open spaces before, and could not help being a little amused at having him right at our door with our food supply in the depleted state that it was. He watched us for half an hour, barking belligerently all the time, then gradually back away and disappeared into the willow thicket a quarter of a mile upstream. During the next night whines and




Map of northern Alaska showing extent of Naval Petroleum Reserve No. 4. Those portions of the Colville River that were explored for fossil plants are indicated by dates July 11 - 18 and July 30 - August 8.

whimpers deep within the thicket indicated that we were near the family abode, and that "he" was probably "she". Northern Alaska is one of the few remaining strongholds of the wolf, but even there it faces extinction because of the $50 bounty offered by the territorial government for each carcass.

Next day, when two planes appeared in the sky, we knew that our concern over the dwindling food stocks and the ominous wolf had all been for naught. One big question still remained, however, whether the planes could land on the boulder strewn flat on which we were encamped. To us it seemed like a hazardous proposition that no sensible pilot would undertake. After buzzing low back and forth a few times, and selecting the best place, the planes settled toward the ground and landed with a hop, skip, and bounce. They drew up near our tent and halted.

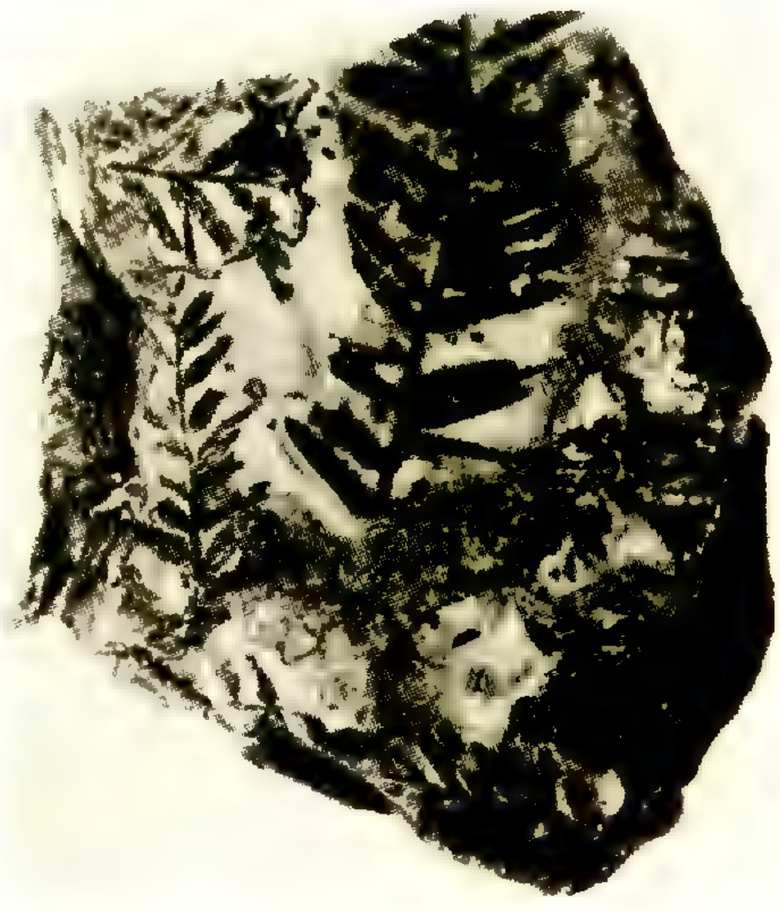
We collapsed our tent in a hurry and loaded our gear. "Can we take off from here?" I asked Joe rather anxiously as my eyes again took in what looked more like a rock pile than a runway. "I think so," was the answer given with that Quaker-like reserve that seems to become ingrown into the bush pilot.

We were back at Point Barrow in two hours where we took stock of our achievements so far. I estimated that our two trips on the Colville River had totalled 120 miles. We had about 350 fossil specimens from 16 localities. We were well satisfied with what we had been able to do, especially since at the start we had received little assurance of finding anything. Although both of the river portions visited had been selected at random, both had yielded quantities of well preserved fossils.

This was our last extended trip. We had planned on one to Wainwright and the Kuk River and its tributaries, but it had to be given up at the last minute because of bad weather. It turned windy and drizzly, and the temperature dropped to near freezing. Although it was still August, the Arctic summer was almost at an end and snow would come soon. We were able one day to spend a few hours at Atkasuk, on the Meade River, when Joe flew in with the mail. There is a shaft coal mine there where the Eskimos dig coal in the winter that they haul back to Point Barrow by "cat" train. We found a few conifer twigs and some petrified wood where the rocks outcrop along the river.

The results of our venture into northern Alaska cannot be fully stated until the material has been completely studied. One fact stands out, however, and that is that there is an abundance of plant fossils in the region we visited. Another fact, and one of significance in a more complete understanding of the geologic history of northern Alaska, is that the rocks are not all Upper Cretaceous as formerly believed, but at some places are definitely older. Although the Prince Creek formation, from which we collected plants below Gubic, is Upper Cretaceous,

all of those beds encountered during the second trip along the Colville River are not younger than Lower Cretaceous. This is indicated by the scarcity of dicotyledons and the predominance of conifers, cycads, and ginkgos. How plants that at present live only in warm or temperate climates once managed to thrive right under the shadow of the North Pole is one of the most challenging problems of science. All kinds of explanations have been offered for what seems to be an anomaly of nature, but none gives an answer that is entirely satisfactory.



Above: Dick and Stewart demolishing a fossiliferous rock at the foot of the bluff along the Colville River below Gubic. Note the large mud flow in distance that extends out toward the water.

Below: Foliage and cone of Sequoia from the rock shown in upper figure.

# THE FIELD COURSE TRAVELING TO TEXAS

Grady L. Webster and Siri von Reis

[The following report on the first two weeks of Dr. Clover's expedition makes us all envious. Apparently the trip is a success — scientifically, socially, and gastronomically. — R. McV.]

Lytle, Texas
Tues. 8 July, 1952

Dear Uncle Harley,

The initial phase of our botanical invasion of the Great Southwest has been satisfactorily completed, and here we are regrouping our forces for the major assault on the vegetation of Big Bend National Park. By Dr. Clover's definition of a good expedition (i.e., "one which encounters no adventures"), we can claim to be more or less of a success. We are, in this and future letters, going to work together, using notes from our respective journals to keep up a running chronicle of this first traveling summer field course in taxonomy given by the U. of Michigan.

This course officially began Monday, June 23rd, but the first two days were spent briefing for the trip and packing. The luggage racks and other equipment which Dr. Clover had ordered from Sears in Detroit did not arrive, and we had to do some frantic last-minute shopping.

We left Ann Arbor at 8 o'clock Wed. morning, June the 25th, after a sumptuous send-off breakfast at Dr. Clover's. We were a party of seven: Dr. Elzada Clover, Grady L. Webster, Florence Grimes, Agnes Kugel, Winifred Moore, Lloyd Schairer and Siri von Reis. We had two new black Ford V-8's with luggage racks into which we had packed our plant presses, bed rolls, cooking gear and clothing.

We drove west from Ann Arbor to Coldwater, then turned south, stopping to lunch at a park on the north side of Fort Wayne, Indiana. Agnes Kugel and Winifred Moore, who had KP duty the first week of our trip, had prepared a picnic lunch for us. That evening we camped at Turkey Run State Park in western Indiana. The campsite was in an area of rich deciduous forest, and nearby was a deep ravine surrounded by tall hemlocks, maples and viburnums. Our twilight supper here was partly illuminated by wandering fireflies. The rest of our evening was chiefly consumed in learning how to inflate our respective air-mattresses, each of which seemed to operate upon a different principle.

We had an early start the next morning, but the lead car kept

boiling over. It turned out that the head gasket was broken, and we stopped at Taylorville to fix it. Afterwards, we had lunch at the city park, and then drove on to St. Louis, Mo., where we made a brief stop at the Shaw Botanical Gardens. After crossing town through rush-hour traffic we drove on to Gray Summit, about 35 mi. west of St. Louis, where the Botanical Gardens maintains an arboretum and greenhouse. Here we spent the night in the "barn", a large frame building which Dr. Edgar Anderson uses as a summer home. After a late supper we washed dishes to Glück's "Orpheus", Boccherini's famous "Minuet" and Beethoven's quartet in C minor, played on an ancient gramophone which Lloyd Schairer discovered in a corner. Our cooking water came from a quaint spring located on a hillside in a patch of Rhus radicans and was considerably enlivened by numerous amphipods (Hyalella sp.). Tempers were a little short, and we were all glad to get to sleep, for the day's trip had been long, although pleasant.

The following morning, before leaving, we went through the orchid house, where there was a magnificent display of Cattleyas, Cypripediums, and Oncidiums as well as a very good collection of Nepenthes. We drove west on highway 66, stopping to have lunch outside of Lebanon, Mo., where we saw our first specimens of Quercus marilandica and Quercus stellata. That afternoon we entered eastern Oklahoma and camped under scrub-oaks on the rocky shore of the Lake of the Cherokees. The water was warm but muddy; crayfish were abundant and troubled the more tender-footed swimmers. We ate dinner about sundown on a cement table overlooking the lake 25 feet below. The stars came out unusually clear, and we slept very well.

Saturday the 28th we drove to Pawhuska, Okla., and then on to a ranch near Hominy where we had barbecue and were met by Lester Vocke, who had picked out our campsite for us at Lake of the Cherokees. A student of dentistry at U. of M., he had planned to enroll in our course, but being unable to, decided to join us for just a few days in Okla. We camped at the 4H Club center on the fair-grounds on the outskirts of Pawhuska. Some of us went into town for a swim — the weather was extremely hot. It had been very warm the whole trip, in fact. We all ate dinner at an air-conditioned hotel coffee-shop. Afterwards we had an involved and exasperating seminar over how to go about studying the prairie the next day; each student had been assigned one project, and this was to be Lloyd Schairer's.

Sunday morning, June 29, we went out to the prairie on the Walker Ranch, accompanied by Mr. A. A. Sewall, County Agent and one of the finest examples of western manhood; he explained the vegetation to us from a cattleman's point of view, telling us, for instance, that Wild Alfalfa (Psoralea sp.) is an indicator of good prairie. We collected plants during the morning and had lunch under a hill-top grove of oaks where we saw our first tarantula. During the afternoon we continued collecting and made a few quadrat studies. Grady Webster made some

explorations on his own on this very bright and hot day and found some interesting numbers, including Mammillaria sp. and — along a creek-bed — Samolus parviflorus, Dracocephalum, Tripsacum dactyloides and Lespedeza capitata. We could not resist another swim in the municipal pool and limeades at the drugstore when our field work was done for the day.

Monday we returned to another part of the Walker ranch, where we explored a beautiful canyon, edged with ferns on which the morning sun fell from between the foliage of overhanging oaks and sycamores. We did not stay here long, however, because Dr. Clover found a timber rattler in a rock crevice and most of the party was a little nervous. At noon we met Drs. Hansen and Waterfall (from Okla. A. & M.) at the Manhattan Cafe in Pawhuska. They escorted us to a couple of ranches and then on to Stillwater. On the way we stopped at a pond covered with Nelumbo lutea. In Stillwater, while trying to shop for groceries and find a camping place, we somehow became very confused; as it turned out, we didn't eat until late, and the girls ended up sleeping in a women's dormitory while the boys spent the rest of the night beside a muddy pond with bullfrogs. By now our chiggers had begun to bother us, and we purchased clear nailpolish and sulphur-powder to relieve the irritation.

After a late start the next day, we worked in the Herbarium an hour, before going to the coffee shop with Dr. Hansen for lunch. The Union building on the Okla. A. & M. campus was plush to the point of being a modern Babylon in itself. We wondered how the students ever studied when they had such luxurious facilities as T-V rooms. We returned to the herbarium and worked truly frantically until 3:30, when the staff very kindly gave us a "tea-party" at which Dr. Hansen introduced us to the faculty and also had Dr. Clover tell them something about our trip. Afterwards, Dr. Roy Chatters, a Michigan graduate, took some of us out to the laboratory where he is working on Cystox, a product which, applied to seed of wheat, will kill aphids which may later appear on seedlings. He and his students are trying to discover the minimum amount required to control aphids. Meanwhile, Grady Webster went with Dr. Celarier, the cytologist, to see his collection of Tradescantias. He had made crosses between a great many species and had a lot of interesting things to say about phylogenetic relationships. He was particularly interested in our collecting material of Setcreasea in the Big Bend.

Wednesday, July the 2nd, we left Stillwater at 6:30 A. M., breakfasted at Guthrie and arrived in Okla. City about mid-morning. Here Lloyd and Grady were hospitalized. Lloyd got the last of a series of typhoid shots, and Grady got a shot for asthma. After lunch we stopped at Turner Falls to admire the view and become acquainted with a few of the calcicolous plants which we were later to encounter on the Edwards Plateau of Texas. Grady led the caravan over the Red River

into Texas, as we all toasted his and Dr. Clover's sovereign republic with warm Royal Crown Cola. After picking up a watermelon in Fort Worth, we arrived at Cleburne State Park at about 9:30 P. M.

Thursday morning, after a disappointingly hot and mosquito-infested night, we tried to cook breakfast. Grady and Siri, who were now taking their turn at KP duty, threw out 1 2 doz. eggs well on their way to being chickens. Before leaving the park at eleven A. M., we all had a look at some of the characteristic plants of the limestone region of central Texas, such as Rhus copallina var. lanceolata, Stillingia texana, Juniperus ashei and Centaurium sp. We drove s.w. from Cleburne, passing through surprisingly green juniper- covered hills, which alternated with flat stretches of prairie. Further south we entered the more hilly part of the Edwards Plateau. We stopped at Marble Falls to look at a specimen of Chilopsis linearis, which had lovely catalpa-like flowers, and to photograph the landscape. We drove on to the home of Grady's aunt, Mrs. Oscar Keithley, in western Travis county and then to Knob Hill, the Websters' place, nearer Austin. Here we unpacked and, after a bite to eat, went to sleep.

We celebrated July 4th by making a vegetational survey of the plants in the Websters' backyard, which was a typical landscape of the Edwards Plateau. During the morning we collected specimens of the common plants, and, after lunch, climbed the hill at the back of the property and made a 1/2 mile long belt transect. The Edwards Plateau was Winifred Moore's project. The flora of this small area was remarkably rich, and we collected almost 200 specimens; besides such common and conspicuous species as Vernonia Lindheimeri, Centaurium Beyrichii, Rhus virens, Melampodium cinereum and Actinea scaposa var. linearis, we found a number of rare and interesting species such as Arbutus texensis, Sophora affinis, Bumelia lanuginosa, and a twining Asclepiadaceous vine which was probably a Gonolobus, with a "mother-of-pearl center." We were rewarded for our climb up the hill by a view of the wild dark purplish hills of the Plateau under storm-clouds. For supper Siri and Grady cooked cheese-stuffed hot dogs, real Texas ranch-beans, and we had peach ice-cream Mrs. Webster had made for dessert.

Saturday we all went in to Austin and worked at the U. of Texas herbarium, identifying collected specimens. We had a little more difficulty than we expected, since Dr. Tharp, director of the herbarium, was out of town. But Dr. Marie Morrow kindly took us all out for a limeade at 4:00 P. M. We returned to Grady's for a Mexican dinner.

We made an automobile tour of the Edwards Plateau on Sunday. While Agnes went to 8 o'clock mass at Austin, the rest of us studied a nearby stand of junipers which seemed to be hybrids between J. ashei and J. virginiana. Then we all drove on to San Marcos, stopping briefly at the springs at the source of the San Marcos River which, unfortunately, had been turned into an aquatic sideshow — complete with mermaids and canned music. We contented ourselves with

viewing a few aquatics, such as Eichornia crassipes, Wolffia and Cabomba. We then drove up onto the Plateau again, stopping at the Devil's Backbone to take pictures. We collected, here, a number of species not seen in Knob Hill, such as Lygodesmia texana, Xanthisma sp., Centaurea americana. We returned to Austin via Johnson City, stopping only at Cypress Mill to see the fine grove of Taxodium distichum, here growing in a very different habitat from that with which it is commonly associated. In the late afternoon we had a swim in the icy waters of Barton Springs, a natural limestone pool almost 1/4 mi. long, operated by the city recreation dept. Dr. Clover's nephew, Ken Clover, joined us with his wife at the Springs. We had a wonderful supper at the Keithley's. We drove back to Grady's over the Mansfield Dam and Mt. Bonnell, from where we had a good view of Austin; Grady had intended this as a short and scenic detour but somehow lost his way; it took us 2 hours longer than it should have to get back home, and Dr. Clover was a little concerned.

At 8:30 A. M. on Monday morning we left for Palmetto State Park in Gonzales County where we had lunch near the concessions building before going on to find Soefke's bog. This turned out to be quite a job; we parked the cars on a hillside beyond Lee Soefke's house, and Lloyd and Grady thrashed around a swampy thicket looking for the bog. Where they first expected to find it they found only a pigsty. One half-hour later we finally discovered what had once been a bog. This was to have been Siri's project, and she was disappointed with both the lack of typical bog structure and the paucity of bog flora. The peat layer was only a few inches deep, and we found only a few patches of Sphagnum. The zonation was very indefinite, and species of Juncus, Scirpus, Cyperus, Eleocharis and Zizaniopsis miliacea were dominant in the herb layer. The only two herbaceous plants typical of bogs were Rhexia mariana and Xyris sp.; Myrica cerifera and Lyonia sp. were also present. The area seemed to be undergoing a change toward more xerophytic conditions. After collecting specimens all afternoon we left not reluctantly, because it had been very warm, but with a sense of unresolvedness. Instead of camping at Palmetto State Park as we had at first planned, we decided to drive on to Lytle, Texas, where Dr. Clover's relatives had left a house open for us. We had hamburgers and malted milks at a drive-in, and arrived in Lytle, via San Antonio, too late to do anything but bathe and tumble into bed.

For the last two days we have been quartered at Lytle, drying presses, washing clothes, studying, and resting up in preparation for the Big Bend trip.

Fondest Regards from

Siri von Reis

Grady L. Webster

July 19, 1952
Big Bend National Park,
Texas

Dear Uncle Harley,

The day we mailed your letter July the 10th we were making a sight-seeing tour of San Antonio. We visited the zoo to see the Texas long-horns, then the Witte Museum where we met the director, Mrs. Quillin, a very kindly old friend of Dr. Clover who showed us around the museum and reminisced over how the Palmetto Park bog had been spoiled by human interference. Afterwards we went downtown to pay homage to the Alamo and to have banana-splits in the fountain room of Joske's department store, the Macy's of Texas. That evening Mrs. Quillin entertained us with an excellent Mexican dinner at La Fonda. On the way home we stopped at the Buckhorn Saloon, infamous during frontier days, but now a remarkably cluttered curio shop with hundreds of animal horns adorning (or defacing) the walls.

Leaving Lytle the next morning, we drove to Garner Park, stopping on the way to look at stands of juniper at the west end of the Edwards Plateau. For lunch we parked at a beautiful spot along the Guadalupe River where we had our first flat tire of the trip and no little trouble with the flimsy bumper jacks provided by the Ford Motor Company. Our evening campsite was also along the Guadalupe River, at the state park, where we swam in a natural pool fringed by huge cypresses and overlooked by an oak and juniper forested cliff. The Indians who (we like to think) swam here years ago must have enjoyed it as much as we did.

Saturday morning at Uvalde we were overjoyed to hear (apologies to our dear Uncle) that Eisenhower had been nominated Republican presidential candidate. After being unimpressed by a look at former Vice-President Garner's unimaginative homestead, we set out into the Mesquite country which evidently didn't catch all of our fancies. Staring at the passing landscape, Florence said, "My God, and people live in this stuff!" to which Grady replied, "Of course; it's TEXAS, the hub of the universe!" That same afternoon we took an hour off to visit the little Mexican border town of Villa Acuña, since some of us had never been to Mexico before. We stopped for the night at Lake Walker on the Devil's River at a fishing camp. . . .

Continuing on our way Sunday morning we got as far as Langtry where we had to wait 2 hrs. for the proprietress of the filling station to get out of Baptist church. Meantime we botanized, visited Judge Roy Bean's place and ate lunch in our cars. As we crossed the desert that afternoon we began seeing patches of green grass, indicating that at last, after 2 yrs., it had begun to rain in the Big Bend. The people in car 148 saw a small herd of antelope. We arrived in Alpine amid the first rain of our trip and took 3 rooms at the Motel Bien Venido .

July 31, 1952
Before a campfire on
the sand dunes of
Monahans, Texas.

As we write again we hear coyotes in the distance and see dim lights from the oilfields all around the horizon. It's been impossible to write until now because of our crowded schedule. But to continue our account:

On the 14th we drove from Alpine to the Basin area of the Chisos Mts. in the Big Bend National Park. Our campsite was located in a forest of Pinus cembroides and Juniperus pachyphloea at an altitude of 5400 ft. and the night was so cool that we appreciated the warmth of our sleeping bags for the first time. Around our camp and the near-by park headquarters the main peaks of the Chisos ("Ghosts" in Spanish -- and they are spectral from a distance!) formed an irregular circle of reddish pinnacles reaching almost 8000 ft. in Emory Park. We were fortunate to be here soon after rain because the slope vegetation was unusually green.

The morning of the 15th our party divided into 2 groups, Dr. Clover, Florence, Winifred and Lloyd going down to explore a canyon near the "window," a gap on the west side of the Basin through which we later saw some spectacular views of the desert sunset. We went with Agnes up the north slope of Emory Peak, reaching an altitude of about 6500 ft. The forest was composed of Pinus cembroides, 2 unfamiliar and interesting junipers, and a perplexing medley of oaks. Juniperus pachyphloea was well distinguished by the alligator-like pattern of its bark, and J. flaccida, endemic to the Big Bend, differed from all others we had seen by its "weeping" habit. The kind of juniper typical to the rest of Texas, i.e., that with stringy bark and non-"weeping" branches, was represented here only by the relatively rare species, J. monsperma.

July 16th we hiked up the Lost Mine Trail, reviewing the flora as we went. We found a number of the marked plants along the path to be mislabelled.

Thursday the 17th we left the Basin and went over to camp at the mouth of Terlingua Creek. We set up headquarters under a big cottonwood tree, and some of us started out to explore the trail up Santa Elena Canyon; this proved to be much more difficult than we had expected, because, due to recent rains, the bed of Terlingua Creek was deeply filled with mud. Everyone turned back except Agnes, Grady and Lloyd; these three waded the creek a half mile above its mouth and then (with no little difficulty) climbed along the wall of the west bank to the mouth of the canyon. They went up the canyon for a half mile but didn't find a great many interesting plants; the vegetation

was quite xeric, and they saw the candelilla (Euphorbia antisiphilitica) in flower for the first time. On their way back they decided to short-cut by wading Terlingua Creek at its mouth, despite the sticky mud, and were sorry they hadn't done it that way to begin with.

After dinner the weather looked so threatening that we repacked the cars and drove up onto higher ground overlooking Terlingua Creek, for we were afraid of being caught in a flash flood. We waited in the cars until midnight, while storms passed by, their lighting intermittently transfiguring the desert; finally some of the party laid their bedrolls down on the road. Lloyd, evidently too tired to come down again after hoisting the sleeping bags down to us, remained on the top of the car the rest of the night. Three of us remained inside of the cars. Incidentally each of our Big Bend projects had been assigned this day: Florence was to do some work on ocotillo (Fouquieria splendens), Agnes to study yuccas and agaves, Winnie to work on some species of Echinocereus as a preliminary to her doctoral problem, Lloyd to collect the grasses, and Siri to collect legumes.

The next morning we returned to our original campsite under the cottonwood tree to cook breakfast. We spent the morning studying the surrounding desert vegetation, which was mostly an open scrub of Larrea and Fouquieria. That afternoon we returned to the Basin, stopping a few times to collect and once to wait for the flooded creek to go down. We took water in cabins at park headquarters and washed some of the desert off of us.

Saturday morning Grady and Winnie scaled Casa Grande, an impressive peak at the eastern side of the Basin; they found a number of interesting plants, including Sambucus, Fraxinus, Prunus virens, and a rare Arenaria.

August 1, 1952
Big Springs, Texas

We are still trying to complete this patchwork letter despite continual interruptions. Last night we were able to work for only a few minutes after dinner.

To return to Saturday, the nineteenth, everyone but us went to see a showing of colored slides put on by a park ranger, Mr. Schaafsma, who had been very hospitable to us.

Sunday we all went horseback riding over the South Rim Trail for 8 hours, stopping at Boot Canyon on the way to see some stands of Cupressus arizonica and Acer grandidentatum. Where we stopped for lunch we had a splendid view of 126 mi. of the Rio Grande where it formed the Big Bend. Coming back, we saw on the north slope of Emory Peak the only stand of Populus tremuloides in Brewster county.

July the 21st we shifted our headquarters to Dagger Flat, an area of limestone in the northeast corner of the park and the classic locality of that splendid Yucca, Y. carnerosana. Lloyd distinguished himself by finding a young panther and killing a diamond-back rattlesnake. Agnes, Winnie and Grady did a 1000-foot line transect across the flat to determine the composition of the vegetation with regard to the yuccas. To protect ourselves from the sun that day we constructed a nomad-like shelter by stringing our large tarpaulin between the 2 cars and propping it up with the dry inflorescence stalks of Dasylirion leiophyllum. Everyone thought it was hot as blazes here but didn't know what was in store for them at Boquillas. The common purple sage of Texas, Leucophyllum frutescens, was here replaced by L. minus, a smaller plant with very striking flowers of royal lavender.

The next day we went down to the southeast corner of the park and camped at an abandoned restaurant near Boquillas on the Rio Grande. On the way we were held up for a while when one of the cars got stuck in a "draw", which was way up because of a flash flood.

You might have called this the nadir of the trip as far as morale was concerned. It was well over 100° that afternoon, and Winnie came back from studying Echinocerei looking very weak. She stayed in camp while the rest of us drove to the end of the road and took the trail to Boquillas Canyon.

Aug. 7, 1952
On the banks of King
River, east of
Eureka Springs, Ark.

Boquillas seems far away now, but that's where we left off our account.

The women of the party were too tired after crossing the mesquite flat to continue on into the canyon; so Grady and Lloyd went on alone and found some very interesting plants. A suffruticose convolulacea, Breweria ovalifolia, with bluish flowers, was quite conspicuous at the edges of deep banks of sand that covered the lower 100 feet of the walls. They pressed specimens of this and other rare plants under the shelter of a big rock when a rainstorm came up into the canyon. They returned to Boquillas after 7 P. M. to a dinner of meat pie cooked by Florence on an open fire. (Sometimes we eat pretty well despite the makeshift conditions of camping!) As eventful as the day had already been, what happened after dinner made it the most memorable of the trip. The girls discovered a number of "white vinegaroons" invading their bedding and the camp was soon in an uproar.* Lloyd didn't help

*In Mexico all that I saw were certainly black. The name is from Mexican-Spanish vinagrillo. They are startling creatures to encounter the first time, but are not supposed to be poisonous, in contrast to their relatives the scorpions, for which they are sometimes mistaken. -- H. H. B.

matters a bit when he killed a scorpion by the cars. It's a good thing nobody noticed the black widow spider which was found near the beds the next morning! Most of the campers were in no mood to notice the beauty of the stars.

The next day we left this forgotten outpost and drove back to Alpine, stopping on the way to study the ocotillo situation.

On the 24th we studied in the herbarium of Sul Ross College and met the Warnocks for dinner at the local hotel. Afterwards Professor and Mrs. Warnock invited us to their home, where we looked at Agnes's and Dr. Clover's slides of our trip and Mrs. Warnock played selections from Bach's "The Well-Tempered Clavier" for us on one of her 3 pianos. The girls remained here while Barton Warnock took the boys to the College and gave them some tips on how to spot grasses in the field.

On the 25th, after packing and making one last trip to the herbarium we went out with the Warnocks to the Baptist encampment west of town and had a ranch-style dinner. The Warnocks cut a watermelon for desert at their home afterwards and put us up for the night.

We left the next morning after Mrs. Warnock served us a banquet-style breakfast (including biscuits) and drove through some of the loveliest countryside in Texas (according to us, anyway) to the Davis Mts., where we camped at the state park. We explored Madera Canyon that afternoon and were surprised at the small number of species in flower. Near camp, however, we found plants which reminded us of Michigan, such as Silene laciniata and Campanula rotundifolia. It was extremely cool in the evening, and we woke the next morning covered by dew.

Sunday we went on to the Guadalupe Mountains. On the way we botanized in the arid, rocky and salt-flat areas north of Van Horn. We had orders not to stop at all on the road, but we just couldn't resist jumping out to grab some beautiful specimens of Nama which grew in fragrant purple carpets by the roadside. We camped near the Guadalupes on a limestone ledge by a spring on the Kincaid Ranch.

Monday the 28th we explored the lower reaches of McKittrick Canyon; a pleasant collecting locality with a permanent stream running through it. Beneath Acer grandidentatum, Fraxinus velutina, and Juglans rupestris was a shrub layer dominated by Choysia, a rutaceous shrub we hadn't seen before; and at the very edge of the stream we found Lobelia cardinalis, Aquilegia chrysantha, and 2 cans of beer. [About this time, Grady, going after an onion (which turned out to be a Nothoscordum) for Dr. Clover, fell on an Agave Lechuguilla and punctured his wrist in 2 places. We rushed him, fainting, back to camp for 1st aid from our 2 reliable nurses. This melodramatic note supplied by Siri. — G. L. W.] As we ate dinner that evening 2 geologists from Columbia Univ. came by and said "hello" to us.

July the 29th Dr. Clover, Agnes, Lloyd and Grady went on a hike up Pine Top Mt. while the others did accumulated camp chores. The collecting on the desert slopes of this mountain (about 7500 ft. high) was interesting but couldn't match that on top, where Lloyd and Grady found a forest of Pinus ponderosa, Pseudotsuga taxifolia, Juniperus pachyphloea and Ostrya sp. Here they collected a brilliant crimson Gilia (G. aggregata), Streptanthus carinatus, Ribes sp. and a Cercocarpus with large leaves (C. montanus). They were astounded to find a pine tree with smooth grey bark which looked like Pinus Strobus of Michigan; it turned out to be P. flexilis. After dinner we drove to Carlsbad, New Mex., and spent the night at a motel.

July 30th we visited the famous Carlsbad Caverns, where most of the party were properly awed.

The next morning we set out for the sand dunes near Monahans, Texas, where we found a riotous spread of varicolored flowers. Heliotropium convolvulaceum dominated much of the landscape with its white flowers. Polypteris sphacelata and Verbesina encelioides added touches of pink and yellow. The flora was rather small but composed mostly of specialized species not seen elsewhere on our trip. The shin oak we found here, Quercus Havardi (?), was only about half a meter high but had tremendous acorns. (Should we quote Emerson's essay on compensation?). We also found Reverchonia arenaria, a peculiar euphorbiaceous plant closely related to Phyllanthus, and Euphorbia carunculata , a rare Chamaesyce with extremely large capsules described not long ago from sand dunes in Oklahoma by U. T. Waterfall.

Aug. 23, 1952
Museums Annex, Ann Arbor, Michigan

This week we can at last finish our account of the summer's trip. Most of us have identified all our plants and can now begin to write our reports.

August 1st we concluded our study of the sand dunes near Monahans and moved on to Big Springs for the night.

Our next stop was Dallas, where we took a much-needed Sunday rest and saw "Carousel".

Monday we drove to Texarkana and, because of a rainstorm, stayed at a motel outside of town. The following morning we drove to Grassy Lake, a cypress swamp, which was Florence's project. That afternoon we went out in kidney-boats and collected specimens. This locality had been studied by Dwight M. Moore, of the Univ. of Ark., and we could well understand why he had made arrangements for us to visit it, for it was the finest cypress swamp any of us had ever seen. On the buttressed bases of the 100 ft. cypresses grew circles of ferns, Decodon, Wisteria and an occasional Saururus. Then there were large colonies of Nelumbo lutea and stands of a tall grass, Zizaniopsis miliacea. Dr.

Clover found a green-flowered orchid, Habenaria quinqueseta, growing on a log. Perhaps the most interesting feature, however, was the floating carpet made up of 4 genera of Lemnaceae: Spirodela, Lemna, Wolffia, Wolffiella. It was particularly exciting to find the last genus, which looks like small green ribbons in the water, for it is rarely encountered.

The fern-green carpet which lay on the dark, glassy water was unbroken by our boats as we passed through. The aisles we glided through seemed like pagan churches, and the light which filled the air like golden smoke made the scene appear to revolve slowly about us, while our boats stood still. As we returned we felt we had journeyed from our staid pseudo-Christian society into a peace of primaeval beauty.

Aug. 25.

From Grassy Lake we continued to Fayetteville, where we stopped briefly to study at the herbarium of the University of Arkansas. Then we took Highway 62 and wound through the beautiful wooded Ozarks along the northern edge of Arkansas, stopping to camp on the Kings River east of Eureka Springs. Here Winnie and Agnes made a wonderful blueberry pie in the dutch oven and we roasted marshmallows in the campfire.

The next day we had a bad time getting thru the unpaved stretch of road between Salem and Theyer, Missouri, and car 148 had to be shoved out of the mud by a bulldozer. We camped for the night in a vacant schoolyard near Sikeston, Missouri and then next day drove over into Kentucky and admired the fine oaks and Liquidambar trees in the green towns along the Ohio River. Our last overnight stop was at Spencer, Indiana, and we arrived in Ann Arbor Sunday afternoon, August 10, after a beautiful and uneventful day's trip. The next week, the students worked in the herbarium and the Botany Department identifying their collections and beginning their reports. Winnie had quite a struggle with her cacti, some of which had begun to rot.

The course officially ended Saturday the 16th, and Dr. Clover left for a fishing trip in Canada to take a no doubt much-needed rest from looking after us. This week the students almost finished determining the collections and have mostly departed, to write up and eventually hand in reports on the summer's work. We expect that this fall there may be some kind of a seminar at which the participants can show colored slides of the vegetation observed and present their particular findings.

This has been an interesting summer and although we had our ups and downs, we think all the others would agree with us that it was, after all, a worthwhile and certainly a profitable expedition. We, at least, would jump at a chance to go again.

Best regards,
Grady and Siri

# MEXICAN BOTANICAL EXPEDITION OF 1952

## I. Up to the subalpine zone of the Nevado de Colima

Rogers McVaugh

In camp, on the Nevado de Colima,
at 9700 ft., Sept. 11, 1952.

Dear Uncle Harley:

This is the beginning of the letter I promised you for the A. G. B., written during a noonday wait for the potatoes to boil.

Joe Sooby and I left Ann Arbor on Sept. 1, as planned, and reached Monterrey on the fourth night after a good trip by way of Cairo, Ill., Little Rock, and College Station, Tex., where we saw Prof. Reeves and Harry Thiers and Chester Rowell.

Our fifth day out we drove down the Mexico City road as far as Antiguo Morelos, then turned up toward San Luis Potosí. We camped in the oak forest just east of Ciudad del Maíz, which by the way is one of the most beautiful oak forests I know, hung with Spanish moss and abounding in plants familiar to North American botanists (e.g. poison ivy, redbud, black cherry, hickories, walnuts, basswood, sweet gum, etc.). Joe was pleased to find Sanicula, in which he has been interested at home.

It rained, of course, while we were camped that night, and we got pretty wet, but the next night we stayed in a hotel in León, Guanajuato, and draped sleeping bags all over the place. We got into Guadalajara on Sunday night, at the end of our first week out, and dried our plants at a tourist court.

This is my first trip to Mexico at any time except the dry season in March and April, and now it is very impressive to see everything so green. The rainy season is almost over, and plants are everywhere in profusion. We stopped to collect in the high grasslands between León and Lagos, where Hartweg made his historic collections about a century ago, and we found more than a hundred species flowering in a single meadow. In April, of course, the same meadows are dry and brown.

After a day spent in Guadalajara buying kerosene, old newspaper and other botanical necessities, we took off early on the morning of the 9th, Tuesday, for the South. We drove through quite a rainstorm, and when we got to Ciudad Guzmán, 15 miles northeast of the mountain we wanted to camp on, we found we could not even see the peak for the

heavy clouds that surrounded it. Our objective on the mountain was the so-called Canoa de Leoncito, which they told us one could reach by car, high up in the fir zone.

Perhaps the "Canoa" deserves a little explanation. The Nevado de Colima, perhaps because of its volcanic origin, is almost waterless except for some few springs up on the north side at about 11,000 ft. The cattlemen and ranchers, who of course run stock all over the mountain, long ago constructed a marvelously well-laid and well-engineered pipeline from these springs around the northeast side of the mountain and down to certain ranches. At intervals the line is opened into watering troughs, originally hollowed logs, i.e. "canoas".

Halfway up to Leoncito, after the motor had boiled a while in low gear traveling through the cornfields on the lower slopes, we stopped at a ranch called El Cerrito de los Puercos, where we watered the engine and asked about the road. The man of the house casually told his son to get himself a cover and some tortillas and go with us, and from then on we had a guide and general helper, Francisco Chávez his name, age 15. We have enjoyed him immensely. The first night, after we got up to 9700 ft. and were stopped by a landslide across the road, we were rained on by the same clouds that had been around the peak all day. Francisco very calmly took charge, and went out in the rain to get resinous knots of ocote (pine) which he shaved and lit. They burned even when wet and from that we had our campfire. We found out later that Francisco didn't know how to light a fire with paper; he used the lighted paper to light his ocote shavings, and lit the fire with the ocote.

Our shelter from the rain is a big canvas which we drape over the truck and secure by stakes. Because the rains are gentle, we get little in at the open ends, but occasionally I get both head and feet wet.

Continued in Guadalajara, Sept. 15.

We stayed up on the Nevado for four nights, long enough to find out that the rainy season is not quite over. The first night the rain stopped at nine, the second night no rain at all, the third a couple of showers at eight and nine, but Friday night it started at five and for all I know it is still raining. We left Saturday morning and came down, only to find it raining everywhere! Usually it seems it rains up high and you can see the sun shining in the valley below.

Between rains we got a few specimens, and one day got up to 13,000 ft., just below the ascent to the peak, before the fog drove us down. The Nevado de Colima is very steep on all sides that I know anything about, and the zonation of vegetation is very evident. The most luxuriant vegetation is between 8000 and 9000 ft., where you get a moist forest of oaks and other deciduous trees, plus pines. It seems strange to see our familiar Tilia, Ostrya, Carpinus, Prunus, growing within

arm's length of such genera as Meliosma, Clethra, Zinowiewia, tree Eupatorium, tree Senecio, etc.

In the deep ravines ("barrancas") which run down off the mountain there is an almost pure stand of fir (Abies religiosa) from about 8500 to 11500 feet. The fir forests are mostly on slopes too steep to stand on, and it is hard to see how they can lumber off, with hand tools, these great trunks which are often 3 to 4 feet through. They are lumbering, however, and we botanists should be thankful, for only by the lumber roads can one drive above about 7500 feet, where the cornfields (and ranches) stop.

From about 10,000 to 11,000 feet the Nevado is ringed by a zone of alder savanna, if such a term be proper. Imagine great open expanses of bunch grass up to one's waist, on almost open steep slopes, tipped up to the angle of repose and dotted here and there with great alder trees up to 60 feet high and with a diameter breast-high of at least 4.5 feet. The alders are just hanging with epiphytic Polypodiums and Sedums (all sterile now). The "grassland" supports a relatively sparse flora, all active now, and consisting mostly of herbaceous perennials: a gorgeous cherry-red Penstemon, a big Yucca-like Eryngium as high as one's head, an Arracacia or nearly so, a very abundant white Eupatorium and a few others.

The subalpine zone, above the alders, from about 11,000 (or 11,500) feet to 13,000, is rather disappointing to a botanist. In spite of what seemed to us to be superabundant rain and fog, the summit ridges are bare and dry. The whole area up to 12,500 or 13,000 feet is covered with a pine woodland (mostly hardly dense enough to be called a forest). There are no other trees, and no shrubs except a big lupine which comes in especially after fir. Under and between the pines, and extending up the slopes beyond them, is a heavy stand of a big bunch grass which they call soromuto, and almost nothing else. We found hardly any "alpine" plants except one Arenaria and a Draba. Sorry we cannot report on the peak itself, which rises to 4340 m. (14,300 ft.?) but it looks bare! Perhaps later —

More anon. Ruth says you have been indisposed. Better now, I hope.

Rog

EDITORIAL NOTES—Richard A. Scott, who was one of Dr. Arnold's field-companions in Alaska last summer, has returned from England. He held a Fulbright Scholarship during the academic year 1951 - 52. Most of his work was done at Kew and at the British Museum (Natural History), where he studied a collection of Eocene fruits and seeds from Oregon, and compared these fossils with those of the London Clay, which is of the same general age.

EDITORIAL NOTES--Ted Bank and his wife Janet will have much to write about as they continue to work over the rich collections of the Michigan Aleutian Expeditions. The article in this number of A.G.B. illustrates an example of the soil-profile records which accompany the samples of organic material which Bank secured for dating post-glacial and pre-historic events by the carbon-14 method. The photographic record and the written notes together form the basis for Bank's graphic interpretations of the soil profile at each locality where samples were taken. In collaboration with the Danish pollen analyst Svend T. Anderson, Mr. Bank[1] has recently published on two localities for which dates will shortly be released by the Radiocarbon Dating Laboratory of the University of Michigan's "Phoenix" War Memorial. Mr. Anderson spent a year in Ann Arbor collaborating with Professor Stanley A. Cain in the preparation of an Atlas of Pollen Types, during which time he held the title of Research Associate in the Botanical Gardens. He has had to return to Denmark but we hope that some way may be found to resume his much appreciated collaboration.

A first Mexican field report has come from R. McV. and is included in this number. As for H.H.B.'s rapid field trip across the northern states, for evening primroses and birches (with a little detour into Canada), it was on the whole successful and very rewarding but some of the type localities and other localities of special interest had been destroyed or could not be visited for lack of time. The highlights of the trip will be reported later. Companions on the trip were John Grayson and his wife Louise; also, from Duluth along the northern shore of Lake Superior, Russell and Nina Ruth (Pollock) Tinkham. Many Michigan graduates of not the very latest vintage will remember Nina Ruth as the youngest daughter of the late Professor James B. Pollock of the Department of Botany. The Tinkhams had only a short time in which to join us, but we enjoyed their companionship while we had it. John Grayson is a graduate student in Botany. Louise concentrated in biology as an undergraduate and is now in her second year of teaching science in South Lyons, which is not too far from Ann Arbor for driving back and forth.

Another Fulbright Scholar who has just returned to Michigan is Robert O. Belcher, who has spent the past year in the study of a collection of Burmese plants which he obtained while a member of the Armed Forces of the United States during World War II. Most of Mr. Belcher's work has been done at the herbarium of the Royal Botanic Garden, at Kew, where is housed the world's greatest collection of Asiatic plants.

The April number of the Asa Gray Bulletin (New Series, volume I, number 2), was mailed on July 30, 1952.

[1]Anderson Svend T., and Bank, T. P., II. Pollen and Radiocarbon Studies of Aleutian Soil Profiles. Science 116: 84-86. 1952.

## FORECAST OF THE CONTENT OF FORTHCOMING ISSUES

A list of our subscribers, with indication of membership in the supporting associations (Please read notice on page 202);

Letters from India, by Dr. Walter N. Koelz;

Glimpses of the natural history of Koror, Palau Islands, by Peter J. and Alma Hill;

Correspondence on oaks;

Ethnobotany of popcorn, by Volney M. Jones;

Botanizing in the Tahquamenon area of Upper Michigan, by Alexander H. Smith;

Botanical description of the Haven Hill Tract, Oakland County, Michigan, by Paul W. Thompson;

A trip to a seldom visited part of the Grand Canyon of the Colorado, by Elizabeth McClintock;

A biographical sketch of Louis Henrik Jordal;

A botanist's glimpse of the Gran Piedra region of Cuba, by Roy N. Jervis;

The geography of diploid and tetraploid races of Tradescantia ohiensis in the region of the Great Lakes, by Donald S. Dean;

Observations on certain species of Oenothera in the Northwest, by H. H. Bartlett;

Studies in Michigan plant geography, by Claude Marvin Rogers;

The Allen walnut of Middleville, Michigan, by H. H. Bartlett;

The foray of the Botanical Society of America, Central States Section, region of Lake Okoboji, Iowa, by Robert L. Hulbary and others;

Botanists of early years in the Bureau of Plant Industry, by David Fairchild;

Ekman, botanical explorer in the West Indies, by Siri von Reis;

Botanical fieldwork in Michigan, summer of 1952, by Edward G. Voss

More letters from Mexico, by Rogers McVaugh;

First impressions of Okinawa and its new University, by Robin Drews;

The collection and preservation of ascomycetous fungi, by L. E. Wehmeyer;

Proposal for a postage stamp commemorating Asa Gray, by H. H. Bartlett;

Botanical news from the Philippines.

THE ASA GRAY BULLETIN, NEW SERIES. — A quarterly publication devoted to more or less informal communication among the members of the Gray Memorial Botanical Association and the Michigan Botanical Gardens Association. Appropriate contributions from members of either group or from subscribers will be accepted. For the present, progress reports of current field, garden, and herbarium work, with readable and relatively non-technical articles in the fields related to systematics, botanical history, biography, and bibliography, will be preferred. There will be special emphasis upon preparatory work for a new "Flora of Michigan". Free use will be made of letters to the Editors (if released for publication by their writers) and of current news notes regarding botanists.

Items for publication should be addressed to either of the Editors at the Department of Botany, University of Michigan, Ann Arbor, Michigan. Contributors may secure reprints of their articles.

Address subscriptions to Dr. Ruth B. McVaugh, Business Manager, 403 Arbana Drive, Ann Arbor, Michigan. Subscription price for Volume I is $3.25 ($1.00 for Vol. I, No. 1 separately, other numbers $0.75 each). Vol. II, $3.00.

THE GRAY MEMORIAL BOTANICAL ASSOCIATION, FOUNDED 1887. — This organization sponsored publication of early volumes of the Asa Gray Bulletin. Later it issued a mimeographed "Bulletin". Its object is to commemorate the life and botanical work of Asa Gray and to assist its members in botanical activity by furthering friendly correspondence and cooperation among them. Interested persons are invited to communicate with the Permanent Secretary, Professor R. Lee Walp, Building 305, Apt. 1, Stanford Village, California.

MICHIGAN BOTANICAL GARDENS ASSOCIATION. — Founded in 1925 to include persons interested in promoting the development and current activities of the Botanical Gardens of the University of Michigan. There are no dues, but subscription to the Asa Gray Bulletin is invited. For further information, communicate with Dr. Frieda Cobb Blanchard, Secretary, 2014 Geddes Avenue, Ann Arbor, Michigan.

N.S. Vol. I October, 1952 No. 4

# The Asa Gray Bulletin

*Edited and published for*

THE GRAY MEMORIAL BOTANICAL ASSOCIATION
and the
BOTANICAL GARDENS ASSOCIATION
OF THE UNIVERSITY OF MICHIGAN
by
*Harley H. Bartlett and Rogers McVaugh*

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# THE ASA GRAY BULLETIN

## NEW SERIES

## VOLUME I

*Edited by*
*Harley H. Bartlett and Rogers McVaugh*

*A Botanical Quarterly published in the interests of the Gray Memorial Botanical Association, The Botanical Gardens Association of the University of Michigan, and the Michigan Botanical Club*

ANN ARBOR, MICHIGAN 1952-1953

Cornelius Lott Shear
Washington, D. C., about 1900.

(Photograph loaned from the Hitchcock and Chase collection at the U. S. National Herbarium, Smithsonian Institution, by the kindness of Agnes Chase, Honorary Curator of Grasses.)

Dedicated
in his 88th year
with respect and affection to
Cornelius Lott Shear
Charter Member, 1887,
of the Gray Memorial Chapter,
Agassiz Association
reorganized, 1931, as the
Gray Memorial Botanical Association;
Founder and Editor, 1893,
of the original
Asa Gray Bulletin.

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Articles by subscribers intended for publication may be submitted to either editor at the Department of Botany, University of Michigan, Ann Arbor, Michigan.

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## ERRATA

| | | |
|---|---|---|
| Page | 66, paragraph 1, line 1 | For Georgii, read Georgei. |
| | 67, legend of Figure 3 | For Georgii, read Georgei. |
| | 156, paragraph 2, line 17 | For Hillii, read ellipsoidalis. |
| | 184, line 2 from bottom | For Robert S., read Robert L. |
| | 192, paragraph 3, line 1 | For Tricholompsis, read Tricholomopsis. |
| | 244, paragraph 7, line 7 | For Mackenzie, read Colville. |
| | 8, line 2 | For Michigan, read the Great Lakes Region. |
| | 266, paragraph 2, line 11 | For Coldanella, read Soldanella. |
| | 13 | For mauritina, read mauritiana. |
| | 267, paragraph 4, line 12 | For Amitostiga, read Amitostigma. |
| | 297, paragraph 4, line 7 | For fir, read fire. |

# THE 1952 FORAY OF THE CENTRAL STATES SECTION, BOTANICAL SOCIETY OF AMERICA, AT IOWA LAKESIDE LABORATORY

## I. Introduction

Robert L. Hulbary
(State University of Iowa)

THE fourth annual meeting of the Central States Section, Botanical Society of America, was held as a foray from August 17 to August 21, 1952, at Iowa Lakeside Laboratory, Milford, Iowa. This biological laboratory is situated on Little Miller's Bay, West Okoboji Lake in northwestern Iowa. In pleasant surroundings on the border of the large lake system an interesting program proceeded under the direction of the program committee (Chairman, H. S. Conard). In addition to several field trips reported on in this issue by members of the program committee, two evening lectures were conducted in the Shimek Library at the Laboratory. On Sunday evening H. S. Conard gave an address on the vegetational areas of Iowa concluding with some of his carefully considered views on plant sociology. A lively discussion on these topics followed. Martin Grant spoke on Monday evening about the flora of Dickinson County illustrating his talk with beautiful colored lantern slides of the lake region and the prevalent plants.

The annual business meeting of the section was held on Tuesday evening, August 19. John Winter, University of South Dakota, was elected Chairman for 1953; Dwight Moore, University of Arkansas, Vice-Chairman; and Elzada U. Clover, University of Michigan, member of the Executive Committee. After some discussion, the Black Hills region of South Dakota was suggested as a possible locale for the next annual meeting.

The foray meeting, attended by 42 persons, ended officially on Wednesday, August 20. Several of the participants, led by Dr. Conard, travelled homeward by way of some exceedingly interesting spots in northeastern Iowa.

Seemingly all who joined in the 1952 foray at Iowa Lakeside Laboratory had a thoroughly enjoyable and profitable experience, enough so, at least, to make similar field excursions to other parts of the sectional area seem feasible and desirable.

Dr. John Dodd reports that algae seen during the foray were dominated by the bloom-forming Anabaena spiroides, Aphanizomenon

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The July number of the Asa Gray Bulletin (New Series, volume I, number 3), was mailed on November 17, 1952.

Fig. 1. Dr. Henry S. Conard, dean of Iowa botanists, who was Chairman of the Program Committee that planned and conducted the Foray. Dr. Conard also gave an orientation lecture entitled "The Vegetational Areas of Iowa". (Photograph by Walter W. Bennett, Aug. 1952, during the Foray.)

flos-aquae, and Polycystis aeruginosa, popularly referred to as "Anny", "Fanny", and "Polly". A hint as to the density of algae in this inland lake region is suggested by his statement that as many as 25 species were encountered in a one-drop mount made from water squeezed from wet moss (Drepanocladus aduncus) collected in a marsh north of the laboratory.

The lectures at the laboratory were attended by a number of persons who did not participate in the field trips, including several of the zoologists. The following list is believed to include all who went on the excursions:

Harriette V. Bartoo
Western Michigan College
Kalamazoo, Michigan

Walter W. Bennett and son Branson
Arnolds Park,
Iowa

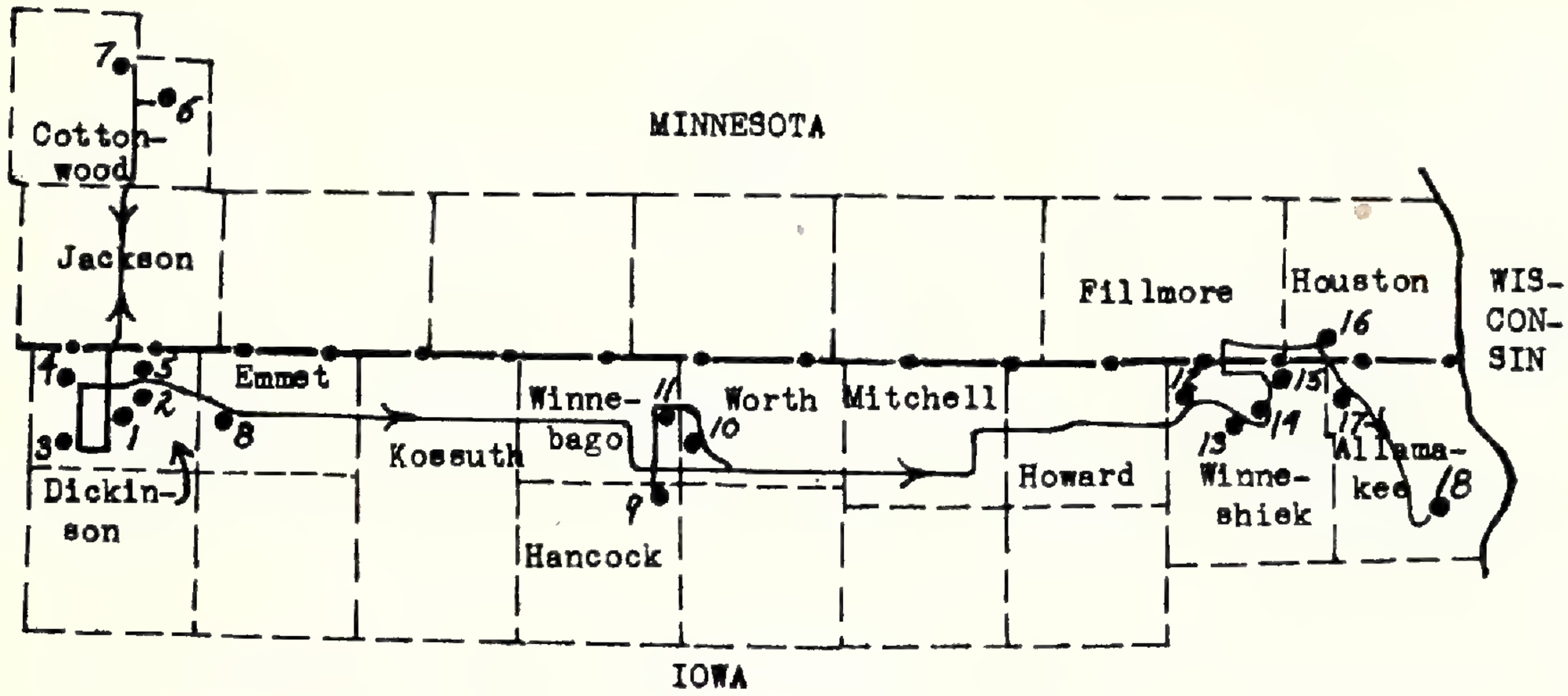


Fig. 2. Sketch map (contributed by Prof. Martin L. Grant) showing localities referred to in the articles on the Lake Okoboji Foray, and the route of the party.

1. Elmcrest Peninsula
2. Center Lake
3. Arend's Kettlehole
4. Silver Lake
5. Grover Lake
6. Shenk Corner
7. Red Rock Falls
8. Nasby Woods
9. Pilot Mound
10. Fertile Bog
11. Lake Mills Bog
12. Kendallville
13. Bluffton
14. Canoe Creek
15. Hesper
16. Spring Grove
17. Quandahl
18. Waterville

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Grinnell College
Grinnell, Iowa

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Mary Gentry
Houston,
Texas

L. J. Gier and Mrs. Gier
William Jewell College
Liberty, Missouri

Martin L. Grant, Mrs. Grant, and
Lois
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Iowa State Teachers College
Cedar Falls, Iowa

Harold W. Hansen
St. Olaf College
Northfield, Minnesota

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Hamlin College
St. Paul, Minnesota

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Department of Botany
University of Florida
Gainesville, Florida

Winona H. Welch
Department of Botany
DePauw University
Greencastle, Indiana

Eula Whitehouse
Southern Methodist University
Dallas, Texas

John Winter, Mrs. Winter, John and Nancy
Department of Botany
University of South Dakota
Vermillion, South Dakota

## II. Bryophytes

H. S. Conard
(Grinnell College)

Bryophytes were of special interest at several localities. On exposed Sioux Quartzite outcrops Grimmia laevigata is conspicuous. Polytrichum piliferum is abundant. In the canyon at Redrock Falls, shaded ledges have Marchantia near the water, Conocephalum in great sheets farther up, and Reboulia high and dry. A shaded rock wall has Fissidens obtusifolius in glaucous sheets at the base, F. minutulus farther up, patches of Plectocolea hyalina, and shreds of the rare Pohlia filiformis.

The fen flora includes Drepanocladus aduncus, D. revolvens, Campylium stellatum, and the extreme disjunct: Calliergonella cuspidata.

At Estherville Wood very fine material of Frullania bolanderi was found, along with many common species. Among the many showy fungi a big Cantherellus was abundant, and one clump of the little earth-star, Geastrum saccatum, was found.

Iowa peat, sold commercially as Hypnum peat, was observed six feet deep north of Fertile under the guidance of Mr. Eli Colby of Hanlontown, owner and dealer. Mostly a sedge-peat, it contains no Sphagnum whatsoever. It is neutral or slightly alkaline. Embedded in

the peat at various depths are strata, six to twelve inches thick, of almost pure Drepanocladus aduncus typicus with unusually strong stems and the leaves still well preserved. Most of the peat land is cultivated. It yields prodigious crops of onions and potatoes.

The sandstone knobs at Hesper yielded Polytrichum piliferum and Dicranum fulvum. The knob at the Rosendahl Homestead added Grimmia conferta and Hedwigia ciliata.

The bryologists did not re-examine the riches of Bluffton and Quandahl. The rock-castle at Waterville still has square yards of Rhytidium rugosum.

## III. Aquatic and Bog Vegetation of the Lake Okoboji Area

Robert F. Thorne
(State University of Iowa)

In Iowa no greater concentration of species of aquatic vascular plants can be found than in the "Great Lakes" area of the northwestern part of the state. Here among the irregular deposits of Wisconsin glacial drift are large and small lakes, ponds, kettleholes, sloughs, marshes, and fens. Good examples of most of these aquatic or semi-aquatic habitats were visited by members of the Foray.

Within a few hundred feet of the Lakeside Laboratory itself is Little Miller's Bay, a shallow body of water protected from the rest of West Lake Okoboji by a long sandspit, mostly covered by bulrushes and water at the time of the Foray. In the clear but vegetation-filled water the more aquatic-minded botanists boated over or swam through masses of Ceratophyllum demersum, Vallisneria americana, Myriophyllum exalbescens, Megalodonta beckii, Ranunculus longirostris, Heteranthera dubia, Najas flexilis, and many species of Potamogeton, including P. richardsonii, P. praelongus, P. pectinatus, P. zosteriformis, P. strictifolius, P. natans, and P. nodosus.

The actual field work of the Foray began on the morning of August 18 along Beck Canal on the peninsula between Miller's Bay and Emerson's Bay of West Lake Okoboji. As the group, under the leadership of Dr. Martin Grant, proceeded along the canal from its junction with Miller's Bay, it examined or observed many aquatic plants , including several of those listed above plus the introduced Nymphaea tuberosa. Considerable attention was drawn to the abundant Lemnaceae which in one cove were so thick that they carpeted the surface of the water to a depth of several inches. Lemna trisulca, L. minor, Spirodela polyrhiza were common in these masses, but most abundant were Wolffia columbiana and W. punctata, both in flower. Additional aquatics were observed around Gull point and in nearby Dickinson Pond.

A particularly beautiful specimen of Sparganium eurycarpum was perhaps the most photographed plant of the whole Foray. Utricularia vulgaris and Sagittaria cuneata were also collected.

On the afternoon of the same day the group visited Manhattan Slough north of the Lakeside Laboratory. Among the more common marsh plants seen were Spartina pectinata, Phragmites communis, Calamagrostis canadensis, Typha latifolia, Scirpus validus, Sagittaria latifolia, Eleocharis palustris, Polygonum coccineum, Cicuta maculata, and Sium suave. On the other side of West Lake Okoboji the much smaller Center Lake produced several other plants. Ranunculus gmelini, Salvia reflexa, Cyperus inflexus, C. rivularis, and C. strigosus were picked up on the sandy margin of the lake, and Eleocharis calva, more flowering Wolffia columbiana, and Gerardia tenuifolia were collected in a marsh at the northeast end of the lake.

Perhaps the most fascinating habitat visited by members of the Foray was Silver Lake Fen, a springy, calcareous bog and marsh near the shore of Silver Lake. Among the more common marsh and moist prairie plants that grow here are calcicolous plants largely restricted to similar habitats from Iowa eastward to western New York. Most noteworthy of the species seen by members of the Foray were Chara foetida, Triglochin maritima, T. palustris, Rhynchospora capillacea, Juncus nodosus, Spiranthes romanzoffiana, Parnassia glauca, Viola nephrophylla, Gentiana procera, Pedicularis lanceolata, and Lobelia kalmii.

Although the Foray ended officially on the afternoon of August 20, a number of the botanists, who were travelling east anyway, spent several extra days visiting, under Dr. Conard's guidance, a number of very rich botanical areas in north central and northeastern Iowa. On the morning of August 21 a brief stop was made at a marsh near Superior in eastern Dickinson County to see the wild-rice, Zizania aquatica.

## IV. Observations in the Driftless Area of Northeastern Iowa

Robert F. Thorne
(State University of Iowa)

After the dispersal of the large group on August 20, those who travelled eastward examined one of the few peat bogs left in Iowa, near Lake Mills, Winnebago County. The peat in this bog is formed chiefly of sedges and the moss, Drepanocladus aduncus; and it is essentially neutral. No Sphagnum is present. Dominating the vegetation of the bog were several shrubby willows including Salix bebbiana, S. petiolaris, S. discolor, and S. pedicellaris, and the red-osier dogwood, Cornus alba stolonifera. Some of the more interesting herbs found were

Equisetum fluviatile, Thelypteris palustris, Triglochin maritima, Carex lasiocarpa, Potentilla palustris, Hypericum virginicum, Epilobium leptophyllum, Cicuta bulbifera, Campanula uliginosa, Galium labradoricum, Aster salicifolius, A. junciformis, and Bidens coronata. The vegetation of this bog is threatened with early destruction because a large drainage ditch has recently been dug across it.

Only five botanists of the original group that started on the optional trip eastward remained on the morning of August 23. This last day, however, proved to be one most interesting botanically. In the morning we visited the Rosendahl Homestead near Spring Grove in extreme southeastern Minnesota to see Arctostaphylos uva-ursi on out-cropping knobs of St. Peter sandstone. We found with the bearberry Selaginella rupestris, Bouteloua hirsuta, B. curtipendula, Prunus pumila, Amelanchier humilis, Scutellaria parvula, Lithospermum incisum, Aster oblongifolius, Aster sericeus, Liatris spheroidea, and many other dry prairie plants.

Driving south again into the northeasternmost Iowa county (Allamakee), we explored a rich, wooded bluff along Bear Creek at the small

Fig. 3. The remnant of the foray party at the bluff forest, Bluffton, Iowa, 22 Aug. 1952. Left to right: Winona Welch, Harriette Bartoo, Lois Grant, Henry S. Conard, Robert F. Thorne, Robert Davidson, Martin L. Grant. (Photograph by Mrs. Martin L. (Dorothy) Grant.)

village of Quandahl. Here grow many species of plants that are limited entirely or in part to this "driftless" corner of the state. On the dripping limestone ledges we collected Cryptogramma stelleri and Sullivantia renifolia. Higher on the wooded bluff we found such noteworthy plants as Juniperus communis, Taxus canadensis, Carex pedunculata, Maianthemum canadense, Habenaria viridis bracteata, Betula alba papyrifera, Corylus cornuta, Dirca palustris, Acer spicatum, Sanicula trifoliata, Diervilla lonicera, Sambucus racemosa, and Cacalia muhlenbergii.

Leaving Quandahl, we followed a particularly scenic route down the winding valley of Bear Creek. On either side of the road and creek steep slopes covered with prairie plants and scattered Juniperus virginiana rose from the valley bottom to the limestone ledges and "castles" that rim the valleys in Allamakee County. One of these high dolomitic limestone castles near Waterville in the southern part of the county was our last stop of the expedition. Here we found several ferns and other crevice plants on the dolomite — especially Cheilanthes feei, Pellaea glabella, Galium boreale, Campanula rotundifolia, Artemisia caudata, and Solidago sciaphila. The rocky ridge terminating in the "castle" was dominated mainly by such evergreens as Pinus strobus, Juniperus virginiana, and J. communis but also common were Quercus muhlenbergii, Q. ellipsoidalis, Ulmus rubra, and Tilia americana. Common shrubs were Physocarpus opulifolius, Viburnum affine, Staphylea trifoliata, and Lonicera dioica. Carex eburnea, Zygadenus elegans, Viola pedatifida, Gentiana quinquefolia, Scutellaria parvula, Solidago nemoralis, Hieracium canadense, and many dry prairie plants covered the rocky soil in the openings.

It was with much regret that the expedition finally broke up at Waterville in the late afternoon of August 23; and the three surviving members parted, Dr. Conard heading west to the Lakeside Laboratory and Mr. Robert Davidson and this reporter pushing south to Iowa City.

## V. Terrestrial Vegetation

Martin L. Grant
(Iowa State Teachers College, Cedar Falls, Iowa)

Although this section of Iowa receives most recognition for its prairie and aquatic vegetation, the humid atmosphere maintained by the many lakes allows the development of respectable forests in protected situations around the lake margins (Fig. 4). On the first field trip (August 18) an oak forest was visited on Elmcrest Peninsula, at the west side of Lake Okoboji. Here the dominant trees are Quercus macrocarpa, Tilia americana, Ulmus americana, and U. rubra, with, as lesser elements, Fraxinus pennsylvanica, Celtis occidentalis, Carya

Fig. 4. The Lakeside Laboratory Campus, Dickinson County, Iowa, 23 July 1948, from S - SE, showing the fringe forest on West Lake Okoboji. (Photograph by Martin L. Grant.)

cordiformis, Acer negundo, Prunus serotina, P. virginiana, Ostrya virginiana, Crataegus mollis, and Pyrus ioensis. Several shrub species and woody vines occur, namely Ribes americanum, R. missouriense, Rubus idaeus, R. occidentalis, Xanthoxylum americanum, Rhus glabra, R. radicans, Menispermum canadense, Celastrus scandens, Parthenocissus inserta, and Vitis riparia. About one hundred species of native forest herbs are found in this area. Along the lake margin the trees found were Populus deltoides and Salix amygdaloides, with a shrub zone, around the ponds, of Salix interior, S. rigida, Amorpha fruticosa and Cornus obliqua.

Several typical prairies near the laboratory were visited on August 18 (at Hale Pond and Montgomery), August 19 (Grover Lake), and August 20 (Arend's Kettlehole and Cayler Prairie). Of these areas the Cayler Prairie is the best example of tall grass, and is one of the largest (100 acres) and finest examples of prairie preserved in Iowa. Equally interesting is Arend's prairie. This is mostly short grass (kept so partly by light grazing), and occurs on the raised rim of a 70-foot-deep depression (with a pond in its center, Fig. 5), forming

Fig. 5. Arend's Kettlehole, Iowa Lakeside Laboratory. (Photograph by Dr. W. A. Anderson.)

the most spectacular local example of a kettlehole. The Hale Pond and Grover Lake prairies are on gravel knobs, and the Montgomery prairie borders the Little Sioux River.

On their higher and drier portions these grasslands have a characteristic flora of several shrubs (Rosa arkansana, R. blanda, Amorpha canescens, Ceanothus americanus, and Symphoricarpos occidentalis) and about 130 species of native herbs. The grasses observed were Andropogon gerardi, A. scoparius, Sorghastrum nutans, Stipa spartea, Sporobolus heterolepis, Agropyron trachycaulum, A. smithii, Bouteloua curtipendula, B. gracilis, B. hirsuta, Koeleria cristata, Muhlenbergia cuspidata, and Panicum scribnerianum. More conspicuous were numerous forbs, especially Compositae, found in flower. In somewhat lower and wetter situations a few more species were added. At Center Lake, on a burned area, was found a beautiful scarlet expanse (several feet square) of the fungus Pyronema.

All the above-mentioned localities are in Dickinson Co., Iowa, but on Tuesday a trip was made up into Cottonwood Co., Minnesota, to visit some quartzite outcrops at Shenk Corner and Red Rock Falls. The flat rock expanses of Shenk Corner provide a very xeric habitat for a number of species not found at all in Dickinson Co.: Selaginella rupestris, Aristida dichotoma, Sporobolus vaginiflorus, Polygonum tenue, Talinum parviflorum, Potentilla pensylvanica, Opuntia fragilis, Isanthus brachiatus, Penstemon gracilis, and Plantago purshii. At

Red Rock Falls a picnic lunch was enjoyed in surroundings where several additional ferns were growing: Cystopteris bulbifera, C. fragilis, Polypodium virginianum, and Woodsia obtusa.

Fig. 6. Part of the group examining the xerophytic area of flat outcrops of Sioux Quartzite near Shenk Corner, north of Windom, Minnesota. (Photograph by Walter W. Bennett, whose son Branson, "America's youngest botanist," carried his own hand-lens and handled it quite professionally!) From lest to right: H. S. Conard, Mrs. C. H. Wolden, Mr. R. L. McGregor (University of Kansas), C. H. Wolden (Emmet County, Iowa), Miss Winona Welch (De Pauw University), H. W. Hansen (St. Olaf College, Northfield, Minnesota), and R. F. Thorne (State University of Iowa).

Wednesday afternoon (Aug. 20) the group was conducted through the Nasby Woods in Emmet Co., Iowa, by Mr. B. O. Wolden, author of several papers on the flora of that region. Here we found several species that seem to have their western limit (at this latitude) in Emmet Co., since they have not been discovered in the forests of the several Iowa counties to the west. All the species of the Elmcrest forest (listed above) occur here, plus the additional trees: Quercus rubra, Carya ovata, Juglans nigra, and Morus rubra, and several species not found at all in the next county (Dickinson) to the west: Osmunda claytoniana, Adiantum pedatum, Carex eburnea, C. sparganioides, Asarum canadense, Hepatica acutiloba, Arabis canadensis, Lobelia inflata, and Eupatorium altissimum.

The first stop on the homeward trip through northern Iowa was at a wild rice (Zizania aquatica) pond, followed by a tour of the forests damaged by oak wilt (Chalara quercina) at Pilot Knob State Park, which was led by Dr. W. H. Bragonier. Here several methods of study (root-graft prevention, killing of infected trees, dead tree removal, and methods of fungus-transmission) are being employed in an attempt to develop methods of prevention and treatment of the disease.

On Friday, August 22, all of the stops made were in Winneshiek Co., the first three being along the Upper Iowa River. A search revealed a single small fir tree (Abies balsamea) at Kendallville, where its extermination had been assumed. Other interesting species found on the limestone slopes there were: Orchis spectabilis, Corallorhiza maculata (a species reported by Shimek in 1907 but inadvertently omitted from all state lists since then), Cerastium arvense, Impatiens pallida f. dichroma, Rhamnus alnifolia, Monotropa uniflora, Pyrola elliptica and Chrysosplenium iowense. Farther down the river, in a white-pine-juniper forest on the limestone bluff, Gentiana flavida and Solidago sciaphila were collected.

The longest stop of the day was made for a four-hour trip through the bluff forest at Bluffton, where extensive collections were made in the largest fir stand in Iowa. Along with many sorts of hardwood trees were found such smaller woody plants as Taxus canadensis, Corylus cornuta , Prunus pensylvanica, Cornus rugosa, and Sambucus pubens, and among the many herbs may be mentioned Camptosorus rhizophyllus, Cryptogramma stelleri, Dryopteris robertiana, Pellaea glabella, Allium cernuum, Maianthemum canadense, Cypripedium calceolus, Arabis lyrata, Gentiana quinquefolia forma lutescens, and Solidago ulmifolia. The limestone-based prairie on top of the bluff yielded Potentilla fruticosa, Lechea stricta, Helianthemum bicknellii, and Antennaria fallax.

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# THE COLLECTION AND PRESERVATION OF ASCOMYCETOUS FUNGI

Lewis E. Wehmeyer

THE collecting of ascomycetous fungi is such a simple matter that it is unfortunate that field botanists, both amateur and professional, so seldom get them except incidentally and by accident. The lower fungi are neglected and should have more attention, for several reasons.

Botanists who collect phanerogams and other higher plants have penetrated and will penetrate to many regions where the knowledge of the fungi is almost totally lacking or very superficial. Although mycological collecting has been more or less world wide, it has often been done as a side issue in connection with general biological expeditions, or has been limited to certain groups of fungi or certain habitats. As a result, our knowledge of certain groups of fungi is extremely "spotty", being extensive for such areas as Europe and North America, but almost lacking in many others.

It is especially in out of the way places that the amateur mycologist or the collector of other plants or animals can be of great help, for many fungi can be collected with little effort. As a matter of fact, some of our most interesting mycological records have come from the examination of herbarium specimens collected by the phanerogamist who has inadvertently brought back to the herbarium many interesting fungi.

As our knowledge of the fungi increases it also becomes increasingly necessary to have larger series of collections from a wider selection of localities, if the details of variation and speciation in these variable organisms are to be worked out.

It is hoped that this brief outline of some of the types of fungi, their habitats, the ways of detecting, collecting and preserving them, their life histories and distribution, may stimulate an interest in more general collecting and study of the ascomycetous fungi. In the following discussion several groupings of fungi, based upon habitat, will be considered in order to give the collector some idea as to where to look, and what to look for and when to collect.

## THE FUNGI OF HERBACEOUS STEMS AND LEAVES

The Ascomycetes and their conidial stages (in the Fungi Imperfecti) which are found on leaves and herbaceous stems are perhaps the most abundant and most easily collected and preserved of all. All the

preparation that is necessary is to dry the material thoroughly and place it in packets with the proper collection data. Herbaceous stems should be broken into convenient lengths (2 to 6 inches long) and if wet when collected, thoroughly dried before packeting them. Living or moist leaves should be pressed and dried between blotters or papers until flat and dry. Convenient packets can be made by folding whole or half sheets of typewriting paper, or, for temporary use, even newspaper, into envelope form. The data required are the name of the host, at any rate to the genus and if possible to the species, the date of collection, the locality, and the name of collector. If the host is unknown to the collector, it should be properly collected for identification.

If one is collecting flowering plants, it is a simple matter to add infected leaves, or a handful of dead stems or leaves of the same plant to the collection sheet. Such material can then be dried with the flowering plant. When final packeting is done the fungus material can be placed in a separate packet with a subsidiary number (i.e. No. 1061a if the host is No. 1061) or can be left with the original material. If this system is followed, even if the host plant is unknown or must be determined later, the collection data for the fungus can be added to the specimen after the host has been identified.

Many of these fungi are extremely minute and easily overlooked by the uninitiated. It is well, therefore, to develop the habit of looking for and preserving dead stems or leaves of each flowering plant collected, even though there is no obvious evidence of fungi being present. Such material will be gladly sorted over by some competent mycologist. Many perennial herbs are found with living stems of the year intermingled with dead stems of the previous year. The latter are too often pulled out by the collector and thrown away. If they were left they might provide the major interest and value of the specimen, from the over-all botanical standpoint! If aesthetically displeasing, they should at any rate be given an "a" number and kept separately. One more word of advice is to get as much such material as is available, for there are often a number of species on the same host stems, and they may be widely scattered. If a liberal collection is made, other subsidiary numbers may be given ("b" & "c" numbers, et seq.) enabling packets of each fungus to be properly filed where they belong. It is also essential to be sure that the host plants to which the dead stems or leaves belong are all of the same species. Usually there are some of last year's stems attached to the base of several species of herbaceous perennials in the same habitat. These are the ones which will bear these fungi, and they must not be carelessly mixed. Leaves if not attached can be compared with living ones of the host plant.

Many of the parasitic fungi of this group have a characteristic life cycle. When living as parasites on leaf or stem, during the summer

or growing season, they commonly give rise to the "conidial" or "imperfect" stage, the spores of which serve for distribution during the growing season. After the fall of the leaves or death of the plant, and during the saprophytic course of development, the ascus stage is formed and matured. This means that in temperate or arctic regions, these fungi mature or "ripen" in the second spring or early summer, which is the best time of the year for collecting them. Material collected during the winter may have immature stages which may be matured in a moist chamber, but this is not always successful. Those species which are saprophytic and those which form the ascus stage on the living host, may be found throughout the growing season.

## SOOTY MOLDS OF THE TROPICS

A few words as to the distribution and appearance of the sooty molds. They are especially abundant on leaves, but also on stems, in the tropics. These tropical forms have been studied extensively in parts of South and Central America, Africa and India. A complicated literature has arisen and thousands of species have been described, so that only an expert can be relied upon for their determination. Nevertheless there remains a large unexplored field in these tropical leaf and stem fungi, and many areas remain untouched.

The so-called "sooty-molds" of these regions belong in the Meliolineae and Hemisphaeriales and are abundant as superficial parasites upon leaves, where they appear as patches of black or sooty-looking mycelium or merely as globose or flattened, black, fruiting bodies which appear as very small specks so that a hand lens is needed for their detection. Members of the Dothideales and the genus Phyllachora are also abundant as leaf parasites, but usually appear as somewhat larger (0.5 to several millimeters) blackened spots which are the emergent stromata, at first wholly immersed in the leaf. These black fruit bodies may occur on limited yellowed or discolored areas of the leaf or on larger dead or dried portions. Superficial, scattered or crowded, black or bright colored fruit bodies may also appear. Any such abnormal appearances of the leaf or stem should be included with specimens.

## THE TEMPERATE AND ARCTIC PYRENOMYCETES

In the temperate and arctic regions a somewhat different group of fungi are encountered. These are the areas in which the most intensive collecting has been done, although such collecting has been confined largely to certain well inhabited or frequently visited regions in Europe and North America. Even in these areas very little comparative study of the fungi of different geographic or ecologic areas has been done.

Intensive collecting in local areas of differing regions will no doubt bring out many interesting relationships. The Pyrenomycetes of herbaceous stems in the Rocky Mountains and the Pacific Coast Ranges, for instance show many points of similarity, but at the same time show certain distinct minor differences. Intelligent and over-all collecting by the local field worker will yield material for illuminating studies.

Among the most interesting floras of this group are those found in the sub-arctic and sub-alpine regions. Certain ecologic factors here seem to favor the development of many stem fungi and a characteristic group of species occur in a more or less world-wide distribution (at least in the Northern Hemisphere). The presence of deep snow throughout the winter gives proper moisture and temperature conditions for the slow development of the ascus stages and the moist conditions during the melting of the snow in the spring favors their maturation.

The sub-alpine and sub-arctic "meadows" of herbaceous perennials are a happy hunting ground for these fungi. Nearly every plant can be found to have from a few to many stems or flowering stalks of the previous year at its base. Such stems usually show numerous black points or spots of various shapes and sizes, which under a hand lens are seen to be the protruding or superficial ostioles or perithecia of Pyrenomycetes, the sessile or stalked discs or cups of Discomycetes or the irregular pustules of Fungi Imperfecti. Such fruiting bodies may be very tiny, often scarcely visible, and it is difficult or impossible to separate this material without microscopic examination, for there may be six or eight species on one collection of stems. The field collector, therefore should take as much material (within reason) as is available from each plant or station and leave the final sorting of the material to the laboratory worker. The best time for collecting is the months of June, July or August, depending upon the altitude or latitude.

These fungi have been collected extensively in the mountains of Central Europe and the northern regions of Scandinavia, and to some extent in Greenland, Alaska and the western mountains of America, but there remain many local areas in the regions mentioned, and large almost untouched areas in Siberia, the Antarctic, the Andes and Himalayas and the mountains of Africa, Central America, New Zealand et al. which would yield collections of great interest.

Special mention should be made of the fungi found on grasses, sedges and rushes. These make up a distinct and most interesting flora and are easily overlooked, for the fruiting bodies are often very minute and scattered, and immersed in the leaf or culm. They occur on the dead portions of leaves and culms, and the best practice is merely to preserve a handful of the dead plants of any grass collected or to examine dead leaves and culms with a hand lens for any minute black points or spots.

## THE LEAF-SPOT FUNGI

Another large group of fungi are the so-called "leaf-spots" which can be found as parasites on the living leaves of almost any plant. Such spots may be small or large (1 mm. to 1 cm.) with a sharply defined margin and surrounded by a discolored, yellowish or reddish area, or may spread out irregularly between or across the veins causing large dead areas or killing the entire leaf. On the center of such spots first appear the conidial stages, as fuzzy superficial growths or as various types of erumpent pustules. Later in the season there commonly appears a central necrotic, brown area, upon which either conidial or ascus fruits may originate, which again appear as tiny dots or small discs. The powdery mildews are usually abundant in late Summer and Fall on many leaves. They appear as a cobwebby or granular whitish surface growth, upon which there later appear the perithecial fruit bodies. These appear as tiny yellowish globules at first but soon turn black. Under the hand lens they can be seen to have various types of appendages. Many of the true leaf-spot fungi, such as the apple scab fungus, Venturia inaequalis, do not mature their ascus fruits until the leaves have fallen and overwintered. The following spring they may be found as minute projecting necks of the perithecia, scattered or clustered on the leaf surface. So it is obvious that there are two times and places to collect leaf-spot fungi: first, during the summer by the examination of the living leaves of all plants, either herbaceous or woody, showing such "spots", and second, by careful examination, with a hand lens, of fallen leaves in the spring or early summer. This is a painstaking process but often yields compensating rewards. It should be remarked that the needles of gymnosperms (conifers) also harbor these fungi. Ascus fruits of the Hypodermataceae, which appear as elongate or "boat-shaped" black bodies, with a central slit, can be found on the fallen needles under almost any conifer. Certain Discomycetes (e.g. Phacidium) are found as erumpent flat discs on the living or dead needles of junipers, cedars and other conifers.

The preceding remarks apply to the leaf and stem fungi of lower altitudes as well as to those of mountains. Lower down they are more scattered and less abundant but perhaps even more varied. Low, moist, weedy areas, wet meadows, or moist woods with herbaceous undercover are good collecting areas for herbaceous stems. Leaf spots will be found everywhere, on any plant, whether herbaceous or woody.

## SPECIAL ECOLOGICAL CONDITIONS

The aquatic or semi-aquatic monocotyledons of swamps and marshes should also yield an interesting flora about which little is known as yet. Another most interesting habitat is the strand flora of grasses, sedges and characteristic plants of sand dunes and beaches and of brackish

and salt marshes. The indications are that these also have a characteristic fungous flora.

## THE FUNGI OF WOODY SUBSTRATA

The fungi of woody substrata are predominantly saprophytes or weak parasites, although a few vigorous parasites (witness the Chestnut Blight, Endothia parasitica) are known. The decay of woody substrata takes place over an extended period of time, often many years, so that there can be recognized more or less of a succession of species, causing the various steps of decay.

A few vigorous ascomycetous parasites can be found on healthy twigs and branches but these are not numerous. There are, on the other hand, a multitude of weak parasites which attack such stems as soon as they are weakened by shading, by breakage, by fire or insect damage, or by other causes. This first series of decay organisms are, for the most part, bark-inhabiting and often limited to this tissue. They are to be found on newly fallen trees, brush piles or shaded or weakened branches of almost any tree or shrub. They develop rapidly under proper conditions of moisture and temperature and often continue to fruit for some time, and can, therefore be found throughout Spring, Summer and Fall. They are nearly always limited to a genus or related genera of host plants and are, therefore, extremely numerous and varied. They, again can be determined only by microscopic examination, so that it is well, in the field, to get representatives from all host genera available.

Collections and preservation of woody stems is much the same as suggested for herbaceous ones: thorough drying, packeting and labelling is all that is needed. Such collections are likely, however, to be more bulky and a convenient container for them is the ordinary one or two pound grocery bag. In the field, the host name and other data can be written on the bag or inserted upon a slip of paper. If the host is unknown, the insertion of a twig with leaves, flower or fruit, along with the fungus collection, will facilitate later determination of the host. If there is any reason to suspect that the material may be critically important, or that the host is not very common and well known in the region, a good properly prepared herbarium specimen should be prepared, so that the phanerogamic botanist who is called upon for the identification may have something for his trouble. Nothing is more exasperating than to be called upon to identify miserably inadequate fragmentary specimens of host plants, and to find something that would perhaps have been important if decently prepared.

The following types of fungi may be looked for as weak parasites on barks:

(1) Discomycetes. There are numerous discomycetous fungi which

live as weak parasites on the bark of woody stems. They are usually erumpent, i.e., breaking through the surface as small flattened discs or shallow cups, either sessile or stalked and scattered singly or in small clusters. They vary in color from black through brown or yellow to orange or red. They can be found on either flowering plant or gymnosperm hosts of all sorts. They may have pycnidial (conidial) stages which appear as open pustules or slight, blackened, projections of various sorts.

(2) Pyrenomycetes. The bark inhabiting Sphaeriales and Dothideales are black and usually "stromatic", buried in the bark tissue but erumpent as various types of pustules at maturity. Some few, like Hypoxylon or Diatrype may form rather large or prominent, tuberculate or widely spread-out stromatic crusts dotted with minute papillae, the "ostioles". Many others form smaller "discs" a fraction of a millimeter to a centimeter in diameter, which commonly consist of a cluster of cylindric or conic, erumpent "ostiolar" necks, which are thickly scattered over the bark surface. Still others are barely erumpent as minute ostiolar mouths and scarcely visible to the naked eye. In such instances they can be more easily detected by splitting the twig longitudinally when the embedded "perithecia" may appear as globose, blackened bodies, or the blackened marginal zones or bleached areas of the embedded stroma may betray their presence. Members of the Hypocreales have bright colored perithecia, which are superficial and appear as yellow, red or green globose granules.

Species causing the later stages of decay are saprophytes and usually grow in or on the wood tissue and are, therefore, found on decorticated wood of larger branches, limbs or fallen trunks. The perithecia may be buried in the wood, and then their presence is usually indicated as a blackening of the wood surface by numerous spots, or a continuous discoloration. More commonly they are superficial, appearing as scattered or densely crowded, globose or flattened, black granules on the wood surface. Species of Hypoxylon may appear as extended crusts of black, red or purplish stroma. On dry substrata, such as fence rails, heavy bark, or decorticated driftwood, the elongate, boat-shaped fruit bodies of the Hysteriaceae may be found. In much such material, the host of the substrate cannot always be determined, but should be wherever possible. If important finds are made on indeterminate substrata, the wood anatomist should be called upon for cooperation.

## THE FUNGI OF DUNG

The fungi found upon animal dung make up a very distinct and specialized flora. There are many interesting species which show special adaptations in their life cycles and physiology to this substrate. In many species the heat or digestive action of the digestive tract is needed as a preliminary treatment for the germination of the ascospores. In

others, as Pilobolus on horse dung and Basidiobolus on frog dung, there are special phototropic and spore dispersal mechanisms adapted to this habitat.

One could spend a lifetime upon a comparative study of these fungi alone. Dung can be collected in the field in any convenient container, such as grocery bags, cardboard boxes or tin cans. Fresh or old decomposed dung should be avoided. Dung partially dried to a firm texture is best. Dung so collected can be kept for some months. To obtain the fungi present the dung must be incubated in a moist chamber. Large masses, such as horse or cow dung, may be placed in any convenient flat covered dish and kept moistened. For smaller pellets, large glass capsules, 6-8 cm. in diameter and 2-3 cm. deep are most convenient. These should be nearly filled with sphagnum moss, sawdust or some absorbent material and a layer of absorbent paper toweling placed over the surface. The whole is then thoroughly soaked, or may be autoclaved, and the water then poured off. The dung pellets placed on this moist surface under the glass cover can be examined with a dissecting microscope.

The fungus spores in such cultures will begin to germinate within a day or two and there then appears a rather definite succession of fungous growths, over a period of several weeks. Such cultures should be examined every few days with a dissecting microscope, for most of the fungi to be seen are microscopic. Such a trip over a dung culture through a microscope is comparable to a field trip through a wood or field, for every cranny and piece of straw or debris may harbor an interesting fungus. Each type of animal dung, furthermore, yields a new set of fungi. Common types of dung, such as rat, dog, horse, or cow are very rich in such fungi. The dilettante may wish to go farther afield and learn to recognize the dung of numerous wild animals in search for exotic dung fungi. Thaxter, for instance, discovered a new species of Haplosporangium, upon the dung of a blind Sphenodon, from the dark caves of Haiti. Bird dung is usually too alkaline to yield many fungi.

The first fungi to appear on such cultures are usually the phycomycetous molds, which show up as cobwebby aerial growths of hyphae bearing sporangia and conidia in various sorts of arrangements. Several types of slime fungi as the small colored droplets of the Myxobacteriaceae, or the pseudoplasmodia of Dictyostelium may also appear at this time. These may be quickly followed by many species of hyphomycetous conidial stages, appearing as white or colored moldy growths, which unfold as handsome arrangements of conidia upon their conidiophores, under the dissecting microscope.

Following these molds there commonly appear several groups of Ascomycetes which are characteristic of this dung flora. The Gymnoascaceae appear as tiny cottony balls or tuberculate masses of

interwoven hyphae, usually white at first but often turning yellow, red or brown at maturity, and with various types of peripheral appendages under the microscope. The Ascobolaceae, of the Discomycetes, appear as tiny gelatinous transparent globules which may remain minute (1/10 mm.) or enlarge into flat or convex yellowish or reddish discs. They can often be recognized by the brown or black dots which appear on the surface, and which are the emergent asci. The Sordariaceae, of the Pyrenomycetes, appear as thickly scattered, superficial or partially immersed, globose to flask-shaped, black, entirely enclosed receptacles or "perithecia", with short stout necks. The dark brown ascospores are ejected thru these necks and cause a discoloration of the surface where they are found. If a large volume of dung or reserve of nutrient material is present, these forms may be followed by various small Basidiomycetes, chiefly of the genus Coprinus. They appear as small white dome-shaped or cylindric primordia, which rapidly develop into sizable fruit bodies of the mushroom type.

## FINAL NOTE ON THE SELECTION AND AVAILABILITY OF COLLECTIONS FOR STUDY

Collections of the various ascomycetous fungi, made as suggested, will retain viable spores for some months to several years, and if properly dried will serve as proper herbarium material for microscopic examination, almost indefinitely. Such material has yielded good water mounts and permanent slides to the writer after being in the herbarium for one hundred years or more. In the field, the fruiting bodies of such fungi may become quickly emptied of spores and become decayed or parasitised. In moist weather, such old material may appear to be in excellent condition and mislead the uninitiated or even experienced collector. Material packeted while still moist will continue to develop abnormally or deteriorate so as not to furnish a good specimen. For these and other reasons, material collected should be sorted for its serviceability in research by an experienced mycologist, and competent specialists should be enlisted to study the various groups.

Editorial Note — The foregoing article by Dr. Wehmeyer was originally prepared as one of a series that was widely distributed during World War II under the general title "Instructions to Naturalists in the Armed Forces for Botanical Work." Some of the numbers were lithoprinted and published in somewhat the same format as the separates from the Asa Gray Bulletin, but others were merely mimeographed or distributed as carbon copies. There were two editions of 500 copies each of No. 1, "The Collecting of Seaweeds and Freshwater Algae" by Wm. Randolph Taylor. It is now proposed to publish in the Asa Gray Bulletin those numbers that have not actually been printed and perhaps to republish the entire series later as a comprehensive manual of botanical collecting.

## Day Dreams

(Road beyond Nobska, Woods Hole, Mass., P.M., August, 1910.)

By Erwin F. Smith

Close shut within her ivory house of dreams,
Where willow nods and spicy Clethra blows,
Upon a wayside pool the lily grows.
Beyond her sedgy bar the blue main gleams,
And o'er dark pines the light of sunset streams.
Her chalice opens to the morning sun,
She knows not evening's glory now begun,
Or sunset's red and gold, or bright noon-beams.

Close shut she hears the piping frogs' refrain,
The droning of the dusty coated bee,
The crow's home call, the veery's wild sweet strain,
The swell and murmur of the sunlit sea:
Yea, most of all the main, soft in her dream,
Blows to her cradle songs from the far
gulf stream.

MICHIGAN BOTANICAL CLUB HOLDS FALL MEETING AT MICHIGAN STATE COLLEGE. -- The fall meeting of the Michigan Botanical Club for 1952 was held at Michigan State College at East Lansing. An excellent program was planned by Dr. William B. Drew, Chairman of the Department of Botany, and Dr. Charles Gilly, Curator of the Herbarium. Following the morning business meeting, Dr. Gilly presented a very informative lecture on the phytogeographic subdivisions and chief vegetation-types of Mexico. Excellent colored slides illustrated the topography of various areas and showed examples of natural plant life as well as the modifications caused by the Mexican farmer. This pictorial presentation portrayed very well the need for preservation of the native vegetation, and the conflict between this and the need for sustaining the economy of the Mexican peasant. It indicated the reason for the terrible erosion which occurs on the steep mountain slopes which have been cleared for agriculture and then suffer from the annual season of torrential rainfall.

Following luncheon at the College Union Building, the group visited an unusual black spruce bog in the vicinity. In addition to a dense stand of black spruce (Picea mariana) and the heavy growth of high-bush blueberry (Vaccinium corymbosum), the most abundant species was the Labrador Tea (Ledum groenlandicum). Other northern species of interest were the creeping snowberry (Gaultheria hispidula), three-leaf Solomon Seal (Smilacina trifolia) and bog rosemary (Andromeda glaucophylla). -- Paul W. Thompson.

# PROPOSAL FOR A POSTAGE STAMP COMMEMORATING ASA GRAY

H. H. Bartlett

SOME months ago there were press announcements that a new series of commemorative postage stamps honoring famous Americans was in prospect. Although these announcements have proved to be premature, it would seem only fitting that sooner or later there should be such a continuation, and that it should include Asa Gray as America's greatest and most representative botanist.

The "Famous Americans" stamp issue of 1940 was exceedingly popular and correspondingly educational. It was well designed, and most of the "Famous Americans" who were honored were worthy of commemoration even if not so eminent as to justify their inclusion in a first group of only thirty-five.

After the original series appeared there was a scattering through ten years of eight more stamps in the same format, the issuance of which was taken to imply not only that the subjects corresponded in distinction with the first group, but that a continuing policy had been established in the Post Office Department of extending the list of commemorative stamps for Famous Americans.

The official establishment of a philatelic "Hall of Fame" calls for the careful choice of additions, to include some of our most eminent Americans who were omitted when the first choice was made. The wise selection of such an added group would justify some of the inclusions in the first group by placing with them the still more famous ones who might logically have had precedence. Nothing is harder, of course, than to measure true eminence. It cannot be created by pressure groups, but it can be reasonably established by some consensus of opinion among those who are qualified to judge. Perhaps American botanists will agree with the writer that their most eminent leader was Asa Gray.

He lived through a period when botany was still a unified science, and his writings prove that his interests covered almost the entire field, at least as a critical reviewer and coordinator. In writing to Mr. Chamberlin of the Post Office Department I referred not only to Gray as the most eligible botanist for a commemorative stamp, but also to other scientists who would be worthy of a place beside him. The letters follow.

Botanical Gardens

University of Michigan
Ann Arbor, Michigan
March 10, 1952

Mr. Herbert S. Chamberlin, Director
Division of Stamps and Philately
Office of the Assistant Postmaster General
Pennsylvania Avenue at 12th
Washington, D. C.

Dear Mr. Chamberlin:

It is reported that the Postoffice Department has decided to extend the series of postage stamps commemorating Famous Americans, and that the additions will be issued in 1953. The plan is very commendable. In the fields of Theoretical Physics and Physics two scientists have been mentioned who would seem in the highest degree worthy of the honor and acceptable to all, namely, Josiah Willard Gibbs and Joseph Henry. The former was one whose original work has emerged to place him internationally among the preeminent men in his field, and surely no leader in American science, as investigator and also as administrator at a time when the Secretaryship of the Smithsonian Institution was the most important scientific post in the Nation, did more than Joseph Henry to give strength and direction to early American scientific effort.

I wish to suggest the following additional names in science for consideration: Asa Gray, America's greatest botanist, and Thomas Hunt Morgan, an almost unrivalled leader in establishing the science of genetics. If the list of additions to the series of Famous Americans were to be long enough, there are other scientists to be considered, Dwight Dana, geologist and zoologist; Louis Agassiz, zoologist and geologist; Benjamin Silliman, geologist; John Torrey, botanist and Erwin F. Smith, plant pathologist.

In the following paragraphs I have indicated salient reasons for nominating the two who, in my opinion, should be the first biologists added to the series of Famous Americans.

(1) Asa Gray. He quickly became the acknowledged leader in American botany during a distinguished career of over fifty years. His studies of South Sea plants in connection with the Wilkes Expedition of the United States Navy indicated the entry for the first time of an American-born botanist into world science. His breadth and vision were confirmed in later years by nis vigorous and effective advocacy of Darwin's theory of evolution. He did more than any other botanist to keep the advance of scientific knowledge of the American flora abreast of the westward movement of the American frontier. He was preeminently the one whose capacity for investigation and authorship

centered American botany at an American institution, namely Harvard University, where the Gray Herbarium is a monument to him and one of the nation's most important botanical assets. More than any other one person, he was largely responsible for Botany's coming of age in America and ceasing to be (scientifically speaking) colonially dependent. He laid the foundations for our knowledge of the northeastern flora so firmly that eight successive editions and revisions of his "Manual of Botany" have been in continuous use for over a century. The first edition appeared in 1848, the Centennial edition, reworked by the late Director of the Gray Herbarium of Harvard University, in 1950.

It is quite in order for a representative botanist to be honored in the new commemorative series, for the old series had only Luther Burbank, who at most could only be considered as having represented horticulture. Certainly in the judgement of botanists it is inconveivable that he would have been chosen to represent the unified field of botany, for dozens would have had stronger claims to consideration. Gray almost was American botany for at least a quarter of a century, for he dominated the field, and had international distinction as a thinker and productive investigator.

(2) Thomas Hunt Morgan. One of the most distinguished experimental biologists of his time, Morgan was the outstanding figure in the development of the modern science of Genetics. As a historical figure he will stand with Mendel of Austria and de Vries of Holland. Soviet pseudo-scientists have singled him out for special obloquy and vituperation in their childish diatribes against what they term "Mendelism-Morganism," thus actually honoring our most productive genetical experimentalist and thinker by linking his name with the founder of the science of heredity. Many Americans, previously unaware of the preeminence of Morgan, have come to know of him through quotations from Izvestia. The application of his work to human biology resulted in his being awarded the Nobel Prize in Medicine in 1933. This was only one of the honors that came to him through his long and increasingly productive career, for many of the scientific organizations to which he belonged honored him by the presidency, among them being the American Morphological Society (1900), the American Society of Naturalists (1909), the Society for Experimental Biology and Medicine (1910-1912), the National Academy of Science (1927-1931), the American Association for the Advancement of Science (1930) and the Sixth International Genetics Congress (1932). In 1943-44 he was Vice-President of the American Philosophical Society.

It would require many pages to list the important contributions of Morgan with even a few words in explanation of their significance. His most amazing performance, of course, was his establishment, within the first few years after he began experimentation with the fruit fly (Drosophila), of the chromosome basis of Mendelian heredity. He

definitely localized the factors for Mendelian hereditary characteristics in the chromosomes of the cell nucleus, and, with his associates, eventually presented chromosome maps in which the relative positions of the determiners were indicated. His work has been vastly applicable in practical plant and animal breeding and in advancing eugenics.

In 1928 the California Institute of Technology wished to found a new Department of Biology in which emphasis would be placed upon experimental and quantitative work, and only in those newer fields in which cooperation from physics, chemistry, and physiology gave promise of important advances. The first choice was, of course, Morgan. His appointment at Pasadena, in view of the circumstances, may be considered one of the chief honors that came to him.

Whatever representatives may be chosen from the natural science fields, I would urge that advice be sought from such organizations as the National Academy of Science, the American Philosophical Society, and the Advisory Committee of the Dictionary of American Biography of the American Council of Learned Societies.

It cannot be supposed that popular or political demand should be too much relied upon, for it may result from interested pressure groups, and be prejudiced if not even uninformed. If Gray and Morgan should be chosen, I wish that inconspicuous but significant symbols of their life work might be unobtrusively but clearly incorporated into the designs of the commemorative stamps, - a spray of a well known plant, Carex Grayi, that was named for the former and a fruit-fly (Drosophila) for the latter. Such little individualized symbols would add much to the historical significance and educational value of the stamps.

Some ten years ago I had correspondence with Mr. Black about proposed stamps in honor of Commander Wilkes, U. S. Navy, and commemorating the centenary of his discovery of Antarctica. Since these stamps (a portrait of Wilkes for the 3¢ and a map of Antarctica showing the progress of discovery through a century for the 5¢) could not be scheduled because of the difficulty of producing the large original Famous Americans issue, it would now seem appropriate to include Wilkes in the new issue, as a famous explorer.

Sincerely yours,

H. H. Bartlett.

If Mr. Chamberlin's answer was not too encouraging, neither was it altogether discouraging. At any rate Asa Gray has been placed in nomination for the "Famous Americans" if the series should be continued. Mr. Chamberlin's letter follows.

POST OFFICE DEPARTMENT
Assistant Postmaster General
Bureau of Finance
Washington 25, D. C.

March 14, 1952.

Mr. H. H. Bartlett,
University of Michigan,
Ann Arbor, Mich.

Dear Mr. Bartlett:

I wish to thank you for your letter of March 10, offering the names of a number of outstanding scientists whom you feel should be included in any extension of the Famous Americans Series issued some years ago.

Notwithstanding reports to the contrary, the Post Office Department does not have any immediate plans for the approval of an additional series of Famous Americans stamps. The information you have furnished, however, will be very valuable should any such decision be reached in the future, and your letter will accordingly be appropriately filed so that it may be readily referred to if necessary.

Please accept the enclosed publication with my compliments.

Sincerely yours,

H. S. Chamberlin,
Director, Division of
Stamps and Philately.

Encl.

ABOUT CULTIVATED PLANTS AND WEEDS, MAN'S CAMP FOLLOWERS – Edgar Anderson is interested in the origin of cultivated plants and weeds to a degree that too few American botanists of this generation have ever admitted. His new book will prove an inspiration to a multitude of botanists, young and old, in studying those plants that accompany man in his destructive activities on the face of the earth, either depended upon and cultivated, or as "camp followers", as Anderson calls the weeds, which are mostly not encouraged but live with man whether he likes them or not. The species of many genera, as a matter of fact, range from cultivated plants to weeds, occupying every stage between. Anderson has a good deal to say about how this may have come about in his fascinating chapter on "Dump Heaps." The book leads off, in fact, with an exposition (from the findings of the Danish botanist Iversen) of the simultaneous appearance in prehistoric Denmark of the first evidence of agriculture and the accompanying weed Plantago lanceolata, now so nearly ubiquitous in northern climes. The Plantago, detected by its pollen, was, to be sure, not from "dump heaps" but from other peaty deposits, but friend Anderson has become quite entranced by dump heaps as the most significant records of man's ancient association with cultigens and weeds, as indeed they are generally considered to be. In this he joins Carl Sauer, and, one may add, not a few others.

The twelve essays which Anderson presents in his "Plants, Man, and Life"* are strung together on a strong thread of continuity, for all deal with some aspect of the origin and evolution, in conjunction with man's activities, of cultivated plants or weeds. The unifying motif harks back to the teachings of Hugo De Vries regarding the phenomenon which he called "vicinism." De Vries is not mentioned, however, nor many of the other botanical worthies who have devoted themselves to such subjects. This, however, is definitely because Anderson's chapter-essays are chiefly inspired by his own rich background of experience, and hardly touch upon historical matters. As such they are charming as a real contribution to botanical belles lettres, of which there is too little. The reviewer was so interested in the sprightly exposition that after jumping about and reading bits here and there, he returned to the beginning and read the whole book through at a sitting.

Some of the chapter headings give a clue to what the chapters are about, and others do not. The first, "Man and his Transported Landscapes" points out the amazing dominance of much of our landscape by introduced plants. Those from Europe, he observes, are genetically and physiologically adjusted to a less rigorous climate than our own eastern natives, and do not prepare for winter so well or so early. So the "transported landscape" of the East stays green late in the Fall instead of becoming brightly colored.

*Anderson, Edgar. Plants, Man, and Life. Little Brown & Co., Boston, 1952.

Likewise the aspect of the Californian landscape is largely characterized by an introduced flora. Every botanist, consciously or not, is interested in the landscape, and Anderson's comments will certainly lead to much checking of his observations. Just where do we see a purely American landscape, and where is it largely conditioned by man's "camp followers"?

Anderson has some strictures on the botanists who visit a country full of interesting vegetation that has been modified by man, perhaps by primitive agriculture, but forthwith seek out some little inaccessible peak of unmodified cloud forest upon which to expend all their efforts. Of course he knows as well as any of us that the specks of primitive nature are fast vanishing and must be studied now or never, whereas that which springs from man's ever increasing destructiveness is not in such peril. Sometimes it actually is, as Anderson shows, and as L. H. Bailey often warned us, but often it isn't. The conclusion to be drawn would seem to be that botanists should continue their avid researches in the primaeval vestiges, which we are sure Dr. Anderson does not really scorn, but not neglect, as they have too often done, the ethnobotanical side of things. I agree with him heartily that the latter is entrancing and important; but after seeing the rapid devastation of nature in Sumatra, the Philippines, and right here at home in the United States, I would not divert a bit of attention from the primitive areas, but, rather, train more botanists, so that all types of vegetation could have timely and effective attention. I once wrote a bit (never published) on the need for more intelligent and trained amateur botanists, and a chapter of the sort might well have found a place in Anderson's book. There is ever so much to do on primitive vegetation that must be done before that weedy creature man spawns over the whole face of the earth. Then most botanists will be, perforce, economic botanists or ethnobotanists. Let us not delay becoming ethnobotanists, but neither let us neglect what little native vegetation remains to us!

The chapter on "The History of Weeds — a Detective Story", deals mainly with Anderson's own studies of Tradescantia. It is a study in what De Vries would have called vicinism. The story is well known to those who have followed the more technical contributions of Anderson and his collaborators, but we now have this memorable, readable summary from his own pen. He concludes: "In answering the question, what is '<u>Tradescantia virginiana</u>' we have learned how critical we must be of scientific names of plants even when they are used by scientists, and what kinds of complexities we may expect in considering the relationships between man and plants." The upshot of his long investigation was that <u>Tradescantia virginiana</u> of gardens probably represents a selection from the segregates of the hybrid <u>T. ohiensis</u> and <u>T. pilosa</u>.

"The Greater Paradox" of another chapter title is that "most

modern taxonomists do next to nothing with cultivated plants; many deliberately avoid studying or even collecting them . . . This is a serious business. To the rest of the scientific world, to agriculturists, to anthropologists, to plant breeders, to geographers, to economists, to historians, the accurate classification of the plants most closely associated with man is of more importance than that of all the other plants of the world put together. To the average taxonomist, these are the very plants least effectively dealt with by his methods; he prefers not even to think about them." These are severe strictures, but our author is, after all, a kindly critic and makes many friendly comments on the essential qualities of herbaria and herbarium botanists. He isn't, after all, so keen for all young botanists to be rushing in pursuit of the latest fads in botanical sciences. Herbarium techniques need some revamping, he thinks, and he points out some improvements made by himself, but still there is no need for all the young men to become intoxicated by the attraction of some new field and dash off into it. That is merely following the latest fad. "A problem which looks humdrum gets passed up for one in which more scientists are currently interested. Eventually someone goes back to the neglected subject with a new set of ideas. This is just now beginning to happen with the study of cultivated plants."

Botanists would feel depressed indeed by this judgment if some mitigating words were not spoken about L. H. Bailey and the Bailey Hortorium. The rest of us will remember the work of the U. S. Bureau of Plant Industry and its long-continued, meticulous records of plant introductions, the noble volumes on plums, grapes, and other cultivated plants by the late Dr. Hedrick of the New York Agricultural Experiment Station at Geneva, the pioneer studies of grain sorghums by Ball at Washington, and many other indications that the botanists are not and have not been as lopsided as Dr. Anderson sees them! One finds elsewhere in the book commendation for Harlan's studies of barley and a few others, but in the main our author dismisses the American literature with scant attention, and jumps from De Candolle to Vavilov and Schiemann in his consideration of foreign workers, except for the mention of a few recommended works at the end, which is far from being even a select bibliography. Nobody who has seen Volney Jones' activity in the Michigan ethnobotanical laboratory would believe that every institution except Cornell has committed itself to lopsided botany!

To Vavilov, the eminent Russian, Anderson devotes a well deserved chapter, entitled "The Clue from Diversity, or Science and the Bureaucrats." He considers Vavilov the one great modern student of the history of cultivated plants. "So great was the force of his intellect, so keen his imagination, that he brought an entirely new class of facts. . . to the history of cultivated plants." The persecution and degradation of Vavilov, the bright and shining star in the Russian botanical galaxy, by the Soviet bureaucrats, is one of greatest individual disgraces of

the disgraceful Soviet regime, but Anderson seems to be so pessimistic as to feel that American bureaucrats have gone far in the same direction. He cites the instance from Washington of an ignoramus in Congress who blocked the appropriation for gathering together wild potatoes for breeding material and held up the matter to public scorn because the proposed budget contained the word "polyploid." One wishes in such an instance for citation of chapter and verse. Since the culprit is probably still proud of himself, for ignoramuses do not change, it would doubtless please him to be mentioned by name, so that he could be reminded of his triumph, and an infinitesmally few botanists could remember to cast their ballots against him! As Anderson sees the state of our science in government laboratories, there are sure to be clashes between science and bureaucracy even in America. He says: "What we need for our national survival are laboratories in which able scientists can work unhampered by Congressional investigations, yellow journalism, cheap politicians, and directors with established reputations — protection at times even from the supposed experts in their own fields." He does not tell us how this could be accomplished, for human nature sorts out into all sorts of Mendelian combinations and a sample of politicians or bureaucrats is bound to be no less diverse than a sample of scientists.

When Anderson gets to the chapter on "Budgets and Scholarship", he says: "By this time it is clear to me, and I should think it would be evident to the reader, that this book is getting a little out of hand." It is, for a fact, but it is so seldom that a scientist really reveals anything of what he is thinking about in a broad way that the book will be stimulating to botanists old and young. It isn't too intemperate, but even if some may think it so, why shouldn't one who has ideas blow off a little steam? What is the harm?

It would not do to close this review without comment on the chapter "Uneconomic Botany", which tells about the course in Economic Botany which was given by the late Professor Oakes Ames at Harvard. Ames was the sort of a man whom biographers are often willing to pass up with a rewording of what they find in "Who's Who." Anderson, who was his student, gives a picture of Ames that is genuinely revealing, and we are much in his debt for doing so. One of the few literary sources that Anderson bothers to cite is Ames' "Economic Annuals and Human Culture". It gives the reviewer especial pleasure that he singles out for honorable mention two dear friends, Mrs. Agnes Chase for her admirable "First Book of Grasses" and the late Lieutenant Safford for his "Useful Plants of Guam". Other books of which he approves greatly are by Agnes Arber (Monocotyledones), I. H. Burkill (Economic Products of the Malay Peninsula), J. B. Hutchinson, R. A Silow and S. G. Stephens (Gossypium), R. N. Salaman (Potato), E. Schiemann (Origin of Cultivated Plants), Sir George Watt (Economic Products of India), and J. C. Willis (Dictionary of the Flowering Plants

and Ferns). With regard to Watt's great work, Anderson writes: "Were I to mark with red the days in my professional life when really important discoveries were made, one of the first candidates would be the afternoon when in answering a request for information I blundered about in the library and found for myself this incredible storehouse of facts". The reviewer had a similar experience, but much earlier, finding, in a most unexpected place, the big Watt Dictionary in the bookcase of the chemical laboratory of the old Shortridge High School in Indianapolis, when he was only a boy, but it gripped his imagination and fascinated him as nothing else there did except the Alembic Club Reprints of Chemical Classics. I hope these things are still there, where boys as well as men may still have the joy of discovering them!

The chapter on dump heaps, that on sunflowers, and that on maize ("Adventures in Chaos") are all self-contained little essays in themselves, but all reiterate the same theme, that we know all too little about our commonest plants. In the one on sunflowers it is pleasant indeed to find recognition of the work of our own Volney Jones. Maybe botanists know a bit more about cultivated plants and care more about them than Anderson gives them credit for, but on the whole he sustains his thesis well, in spite of a devastating disregard for most of the literature and most of the workers. Anyway, he wanted to write this particular book to be read instead of referred to, and he has certainly done something notable.

"Plants, Man and Life" is a little book, to be read from cover to cover at a sitting, but then to be treasured as one of the few new books in the scientific library that clearly reflects the personality and thinking of its author. Read it and enjoy it, as I have done.--H. H. Bartlett

## THE DEATH OF RAY C. FRIESNER

It is with sorrow that we learn of the death of Ray C. Friesner, on December 1, 1952. Professor Friesner was well known for his work on the flora of Indiana, and for his lively interest in Solidago, and in plant-geography in general. A former student at the University of Michigan, in 1919 he joined the staff of Butler University, where he ultimately became Professor of Botany and Dean of the College of Liberal Arts and Sciences. A biographical sketch with portrait will follow.

# THE BRAUN-BLANQUET SYSTEM OF NOMENCLATURE FOR PLANT SOCIOLOGY EXAMINED FROM THE STANDPOINT OF LINGUISTIC PROPRIETY

H. H. Bartlett

DURING the last 40 years Braun-Blanquet and members of his school have published a large number of contributions in which they have proposed, and he has used, a nomenclature for plant associations that has highly undesirable characteristics. Some twenty years ago I protested against the linguistic improprieties of his system in "Ecology", but my criticisms apparently appeared to him to have little validity and he and his collaborators have disregarded them.

Now a new edition of his "Pflanzensoziologie" has appeared and there is a movement for botanists officially to approve the Braun-Blanquet system of nomenclature for general use, by recommendation of the next International Botanical Congress, to be held at Paris in 1954.

In opposing the proposed action I proceed from the supposition that basic botanical terminology should continue to be Latin, and that a systematic ecological nomenclature, even if only for translation or adoption into various living languages, should be Latin. Now if this is so, the Latin should be truly such, not a bastard imitation Latin incapable of translation or of being understood without arbitrary definition. The Latin name of an association or other plant society if consisting of more than one word should be grammatically correct, so as to be usable with precision in a Latin sentence. Likewise a name or other term consisting of one word should not be too barbarous from the standpoint of word formation: even if New Latin it should conform to reasonably good Latin usage. Finally, it should be translatable into any other language with retention of the sense. These would seem to be three good criteria for judging the Braun-Blanquet nomenclature of plant associations.

Braun-Blanquet's classification as given in his Pflanzensoziologie, where it should be clearly explained, if anywhere, gives the categories in German, and I have tried to equate them with Latin. They are all "Gesellschaften", or associations of various degrees of inclusiveness, as we would say in English, but, in view of our author's narrower definition of "Association", "Gesellschaften" should perhaps be translated in some other way, as perhaps "Assemblages". However that may be, the "Gesellschaften", with my suggested Latin equivalents, are as follows:

1. Klasse; Latin, Classis
2. Ordnung; Latin, Ordo
3. Verband; Latin, Tribus

4. Association; Latin, Associatio
5. Subassociation; Latin, Subassociatio
6. Variante (Rasse); Latin, Variatio
7. Fazies; Latin, Facies

Let us first take the categories in order. It would appear that in any major region there may be several classes, and within each all of the categories may be represented, ranging from the class itself down to facies, and that all of the classes together comprise what Braun-Blanquet calls an association circle. This is a major geographic, floristic, vegetational concept which plant geographers generally recognize as the sum total of habitat groupings in a naturally delimited regional flora. In the Braun-Blanquet textbook the term appears merely in German, as "Gesellschaftskreis". What he would call it in Latin he does not tell us. His English translator uses "circle of vegetation". In English this suggests no useful concept, if anything at all, and might better be replaced by the Latin equivalent of regional flora or phytogeographic region, which would be meaningful as translated into any language. As a figure of speech "circle" is fallacious, for it is forced to apply to a complex mosaic, and even if not silly in German, it certainly seems so in Latin or English.

The next higher category is only implied, but must be something higher than classis. The classes, by the Braun-Blanquet system, are lesser categories and are to be called by such names as Quercetea ilicis. These names are therefore in the plural, like the names of higher categories in systematic botany. The word querceteum would be an adjective used as a substantive, and would mean "pertaining to a quercetum or place where oak grows". One feels an implication that there should logically be an ecological super-class Quercetea as the total of all plant societies in which oak is the dominant feature. As such it might or might not be a useful ecological concept. That would be a matter for phytogeographers and ecologists themselves to decide. Braun-Blanquet finds that one of the classes of Quercetea that can be usefully defined includes those in which Quercus Ilex is the dominant oak, and these he calls the Quercetea ilicis, a name which, purely by accident, is distinctive and grammatical, for ilicis is the correct genitive of a genuine Latin name for a particular oak. That it is also the generic name for the hollies might be considered by some as a reason for avoiding its use, but Quercus Ilex is so well known that the argument might be disregarded.

It is a curiosity of French botanical syntax that there is no feeling for Latin names of plants as being either singular or plural. A Frenchman says "les Juncus" without a qualm, using a singular as a plural. American botanists are beginning to say "a Rosaceae" without any sense of shame. One fears, from his general vagueness in definition of terms, that Braun-Blanquet has no convictions about whether, for such a class name as Quercetea, he means it to be

singular or plural. Giving him the benefit of the doubt, it may be assumed that he meant to use the plural of querceteum.

The next lower category is the order, and the example given is Quercetalia ilicis. Again we are confronted by a logically confused situation. Presumably there are various Quercetalia, of which those including Quercus Ilex are an order, whereas Quercetalia in general are a sort of an unmentioned subclass or superorder. Perhaps I am all wrong about this, but I think that is what any person not brought up at Montpellier would naturally suppose.

However that may be, Quercetalia is evidently the plural of quercetale, another adjective used as a substantive and meaning just the same as querceteum. There can be no objection, in scientific terminology, to using the two adjectival forms to designate different categories.

The example, Quercetalia ilicis, designates an order of plant societies characterized by the presence of Quercus Ilex. Again no exception can be taken to the name from the standpoint of grammar, for again it is one of the few out of many names used by Braun-Blanquet that is correct.

We may now turn to the next lower category, the "Verband", for which Braun-Blanquet does not bother to give us a Latin equivalent. His American translators, Fuller and Conard, were satisfied with "alliance", and the appropriate Latin might be confederatio. Braun-Blanquet says that the names are to end in "-ion" but doesn't say why this suffix is linguistically appropriate. Two possibilities present themselves: (1) The name may be intended as a pseudo-Greek substantive derived from a Latin adjective (quercium) in turn derived from a generic name (Quercus). It is, according to this supposition, a neuter singular. The example given is Quercion. The plural would presumably according to our supposition, be quercia; it would thus correspond to such historically interchangeable names as Xanthoxylum and Xanthoxylon. (2) The name may be intended as an arbitrarily and badly formed third declension noun with such excessively poor analogues as pecten, and it would then be quercionis in the genitive singular and (presumably intended to be neuter, like the names in other categories) quercionia in the plural. It is not mere quibbling to want such questions answered, for plant nomenclature is Latin, many authors still write about plants in Latin, and there should not be a vaguely Latinized terminology that nobody knows how to handle grammatically. Speakers of French, with their complete disregard for the difference between Latin singulars and plurals will feel no distress in using the Braun-Blanquet terms, so long as they stick to French, but speakers of English are still bothered by grammatical improprieties in handling Latin words. Most Americans have become calloused to saying "data is" instead of "data are", but good editors still refuse to let such illiteracy show itself in print, and only a few odd botanists permit themselves such linguistic misdemeanors as "the Juncus of our region are ten."

We are told by Braun-Blanquet that the "alliance" or "Verband" corresponds to the genus of systematic botany. The example he gives is Quercion ilicis. We can only assume that there are other quercia (or should it be quercionia?) beside the Quercion ilicis. If so, what are some of these other quercia? Is there maybe a tribe of them between the order and the "Verband"? If there is only one order in a class and one alliance in an order, why bother to have so many categories that are all just associations of Quercus Ilex? Non-ecologists just can't see the value of multitudes of vague, obscurely used formal terms, and feel that any effort to legislate their establishment would be a minor calamity even if the net result in the long run were merely to make the literature of an interesting field of botany temporarily ludicrous.

Now for the association. Here we are on old familiar ground. Our Latin term for the category may be associatio, of course, and the category includes such good concepts of the classical Latin dictionary as quercetum, juncetum, palmetum, pinetum, olivetum, filicetum and many others. These words mean places where Quercus dominates, or Juncus, or palm, or pine, or olive, or fern. They are crystal-clear, and as many analogous words can be made from generic names as we like. Braun-Blanquet gives us the example Quercetum ilicis. This is perfectly proper, for Ilex is a substantive in apposition, a single-word name for a definite kind of oak. It is the kind of a true specific name that more careful botanists have chosen to capitalize when it occurs as the second word of a binomial, just to indicate that it is a full name in itself that anybody can detach from the binomial and use as a complete common name if he likes. So its use in the genitive, as in Quercetum ilicis, with the meaning "oak woods of Quercus Ilex" is entirely commendable.

This commendation cannot, however, be extended to the vast majority of associational names which one finds in running through Braun-Blanquet's new book. Most of them are very bad, for they are made by taking the adjective of a binomial plant name, putting it into the genitive, although it is not a name in itself and is utterly non-distinctive, and emerging with a senseless binomial associational name. A few may be examined at random.

A typical example with the single simple objectionable feature is Androsacetum alpinae. This is intended to mean Androsacetum of Androsace alpina, but the full specific name, the binomial is not given, so the name of the association becomes nonsense. Putting in the full name would make Androsacetum Androsacis alpinae, which is grammatical and diagnostic, but disagreeable because of its length to those who wish officially to saddle ecology with a nonsense nomenclature.

Another example is worse. It is Curvuletum. Nobody, except maybe a central-European botanist, would be able to guess at the

meaning of this. For the sake of economy of words, only the non-distinctive part of the binomial Carex curvula is used in this nonsense word. The idea that it is intended to express should properly not be condensed into a single word. That cannot be done in Latin or in some other languages with either correctness or clarity. Properly the "curvuletum" should be Caricetum Caricis curvulae. The plant sociological aspect of ecology has everything to lose and nothing to gain by the adoption of an inane jargon. It is a very attractive and interesting subject and should not be made into a repellant and unpopular specialty of a few. Words are meant for use, and phrases intended for use as names should contain ordinary words, Latin or other, that every botanist can easily become acquainted with and understand. There is no reason for not using three or four words that convey an idea correctly instead of one or two that are etymologically meaningless or incorrect. The Latin simple or phrase names for plant societies should be so correctly composed as to be understandably (i. e., grammatically) usable in a Latin sentence. Then, if they had no exact vernacular equivalent in any particular region, they could be precisely translated for common use.

Now another adverse criticism of Braun-Blanquet's names of associations is necessary. Coupled, as Braun-Blanquet would have them, with the genitive of the second word of a binomial name, it would not infrequently happen that the word would already be a genitive, generally of a botanist's name, but more rarely of a region, place, or habitat. An example is Eriophoretum Scheuchzeri. Grammatically this does not mean an Eriophoretum of any particular Eriophorum, but the eriophoretum of the botanist Scheuchzer. It does not and cannot be made to mean an eriophoretum of Eriophorum Scheuchzeri. There is no way in which to compress this concept into less than three words in Latin, and there is no reason why three words cannot be satisfactorily used. Why use inane gibberish instead of language?

Braun-Blanquet does not approve of geographic adjectives being used to give precision to the names of associations. These he instances as tolerable but best avoided. The examples he gives are Molinietum mediterraneum, which would strike one who does not follow the system of Braun-Blanquet as one of the best of his names, and Xerobrometum rhaeticum, which introduces still a new type of error. There is no genus Xerobromus, and therefore no place where Xerobromus dominates a Rhaetic habitat. Rather, the name is intended to apply a dry Rhaetic brometum. It is a bad linguistic hybrid also, and should be replaced by Brometum siccum rhaeticum. Still more atrocious is Hygrocurvuletum. This isn't a place where little liquid curves abound, but a damp place where Carex curvula dominates, a caricetum humidum Caricis curvulae.

Now let us pass to another type of linguistic infelicity. If an association has codominants, Braun-Blanquet approves such a barbarism as

Rhodoreto-Vaccinietum. In this term Rhododendron seems to have been replaced by Rhodora, although the characteristic plant, Rhododendron ferrugineum is never, to the best of my knowledge, placed in the subgenus Rhodora, or the genus, as some, following Linnaeus, have considered it. This may be excused as a mere inadvertency, but more serious is the fact that a group of names follow the same bad style of construction. It is not good Latin. If the concept is that of a Vaccinium formation in which Rhododendron occurs, one could well say Vaccinietum cum Rhododendro. Then there would be no difficulty of comprehension which certainly arises from such a barbarism as Brometo-Caricetum Hallerianae. The intended meaning of this would appear to be "a caricetum of Carex Halleriana with codominance of Bromus". How much better it would be to say caricetum Caricis Hallerianae cum Bromo! That clearly means something now, and will for ages, whereas the barbarous and intrinsically meaningless condensation might well go out of style in a short time, leaving the literature that employed such terminology solely for antiquarian research. The example of a formation characterized by Carex Halleriana reminds one of Haller's refusal to accept the Linnaean improvements in systematic nomenclature, and that Haller was wrong. Anyone comparing the nomenclatural innovations of Linnaeus with those of Braun-Blanquet will realize, however, that Linneaus had thought his problem through, and, for genera, species and varieties had perfected his system so that it could be approved by men of learning generally. He strove to observe linguistic propriety and to present a system that would be logical and meaningful. He succeeded in the main, and if the precedents that he established and the rules that he laid down had been more generally followed, botanical and zoological nomenclature would have been far less subject to derision than they have become.

Linnaeus left the nomenclature of higher natural groups very largely to his successors, for the time had not yet come for great progress in natural classification.

There is a possible parallelism in plant sociology. There are many well known plant associations (which Braun-Blanquet compares with the species of systematic botany) that can be named for the dominant species in the classical manner, and as Braun-Blanquet advocates. Thus we may have various kinds of junceta, taking their name from various Junci, and as an example I could instance the juncetum Junci militaris of certain Massachusetts ponds. This would have no especial relationship ecologically with certain other junceta of saline desert marshes or of sandy coasts that I call to mind, and so all junceta would not form anything like a generic grouping of related habitats. The same might be said of querceta, or of betuleta. The junceta might in some instances be closely related to scirpeta, and intergrade with them, just as some betuleta would intergrade with saliceta or lariceta.

So there is no complaint to be made about the naming of the associations except for the clipping of the name of the characteristic species down to a meaningless fragment, an indistinctive adjective in the genitive, of which the modified substantive is left to be implied. I insist that the future popularity of ecology and the utility of its literature will be best insured by sticking to good plain grammatical Latin as a basis for nomenclature. Certainly ill-conceived, grammatically garbled terminology cannot be made to stick in the long run even by enactment of an international botanical congress, and it would be a pity for any more of the literature of ecology to be cluttered up with repulsively illiterate jargon, so that it will fail to be read and appreciated.

In some countries good ecological descriptions of the vegetation could be written using only popular names for associations. I had an illiterate but wise old Maya Indian companion in the Petén district of Guatemala who gave me promptly and without hesitation the name for any habitat that I asked about. Chanek used the Spanish terminology, of which the following examples come to mind: escobal for the areas of escoba palm, sapotal for the chicle gum (sapote) forest, and caobal for the mahogany forest. The suffix of these excellent ecological names is of course Spanish and derived from the Latin adjectives in -alis, -ale, and the Latin equivalents might well continue to be used for some category of ecological names. Care would have to be taken not to degrade the nice Spanish system by monstrosities and barbarisms.

In the San Carlos Mountains of Tamaulipas I had earlier experience of the same sort. My Mexican guide, Pedro Castellanos, had been equally as fluent as Chanek in providing names of associations formed in exactly the same way. If at first I had the suspicion that there could not be so simple and pleasing a popular terminology, it was allayed by finding on the detailed maps many a place name taken from the name of a common plant association, and agreeing with what Pedro told me in Mexico or Chanek in Guatemala. The Mexican habitat names were not infrequently from Aztec instead of Spanish, and those of Guatemala and British Honduras from Maya, but the Spanish derivatives of these names could easily be Latinized for use in ecological nomenclature, and would parallel so neatly the popular terminology for Latin America, that attention should be given to doing it. An escobal, for instance might be called an escobale (neuter singular) and the plural would be escobalia. The writer has elsewhere given examples of the admirable Spanish terminology for plant associations as encountered in Mexico and Guatemala, and has recommended its use by botanists.

This consideration of Spanish terminology has not been altogether a digression, for Braun-Blanquet uses "the suffix -etalia" for the designation of the "orders" of plant societies. This is of course a

use of the same adjectival form used as a substantive that has developed in Spanish from Latin, but instead of the ordinal names being derived directly from plant names, they come from the Latin names of associations which have the ending "-etum". They have, therefore, a combination of suffixes. It would seem that the Latin equivalent of the Spanish terminology might well be used for minor associations, or for those of indeterminate category, and this leads us to the consideration of the minor categories of Braun-Blanquet, those that are of less magnitude than "associations". These are the "Subassociation", the "Variante" and the "Fazies".

In his chief discussion of nomenclature, Braun-Blanquet gives as an example of the "Subassociation", "Quercetum ilicis pubescentetosum". Of the three words the first two are beyond reproach. The third, however, is a misbegotten monstrosity. It is derived from Quercus pubescens, and pubescens is treated as though it were a substantive noun instead of the nondistinctive modifying adjective that occurs in many a botanical name. This third word is a derivative of pubescentetum, which must be "the place where a grammatically undesignated pubescent thing grows", and that is made into an adjective pubescentetosum to modify Quercetum. So the final combination means "pertaining to an oaky place of ilex oak partaking of the characteristics of a place where some undesignated pubescent thing grows." It is all done in three words, but it would take only five to make sense out of complete, utter nonsense: "Quercetum ilicis cum Quercu pubescenti". This is understandable in any context and may be translated into any language. There is no need in ecology for such condensation as to require the formation of a lot of grotesque irregular compounds and derivatives which will always have somewhat the status of formulae instead of names and which will certainly never find their way into the dictionaries of any language. Their function would be to set ecology apart from the more pleasant and comprehensible systematic aspacts of botany and make it the specialty of an exclusive little coterie, distinguished by their use of a peculiar and recondite terminology all their own.

It is freely admitted that new technical words and meanings for old words are constantly being invented and found useful in all sciences, and that their use really is essential for the advancement of science. The best ones, however, are regularly formed so that they may become practically universal in usage. Such a word as the one I have just especially criticized, "pubescentetosum" has meaning only in particular phrase names and then not grammatically but only by abstruse implication or arbitrary definition. It is definitely bad, and all similar words are bad. Careful writers would refuse to use them, and the official adoption by an international botanical congress of a system of nomenclature that imposed them upon plant sociology would drive out of that aspect of botany all who wanted to keep their science

intelligible and lying within the cultural background of as many people as possible. It should not be the objective of any group of scientists to alienate themselves and their subjects by the use of jargon or cant. Rather, they should fuse their special knowledge at as many points as possible into the common experience of as many persons as possible, preferring words that are in the dictionary or so regularly formed that they do not need to be.

I have heard the objection that it takes too many ordinary words to write about ecology, and even that they do not look "scientific". There is no virtue in being abstruse. There are times when symbols other than words and formulae are very useful or even indispensable in the representation and handling of ideas, but the classification and decription of plant associations is still in the stage at which words are the best symbols of ideas. So why should they not be as crystal-clear as possible?

In condemning much of the Braun-Blanquet nomenclature as repugnant to good taste, I have made exception of that simple part which goes back to classical times. In that part we have a basis for a better start. I would advise the use of good plain English, or Spanish, or German, or French, or Latin, until a more acceptable system of nomenclature has been devised, and in the meantime there will be time for discussion and debate. Furthermore the literature of our time will not be defaced and made unintelligible to the ecologists of the future by barbarous constructions and usages which would surely soon become obsolete. Man is so rapidly changing the face of nature that no one should for a moment believe that the ecological contributions of the present will soon be superseded and useless. Many of them will remain the best or the only records that we shall ever have. So it seems important that they should be written as clearly, quotably, and translatably as possible.

I have not, I believe, done the Braun-Blanquet nomenclature the injustice of selecting the most atrocious bits that I could find. Rather, I have taken only what he has presented, presumably with his approval, in his general treatise, the second edition of his Pflanzensoziologie. Needless to say, some of the examples referred to were the invention of others of his school, and Braun-Blanquet himself is not personally to be reproached for all of them. It is the sum total of his school's nomenclatural efforts that I find so bad, and the few examples that I have commented upon are those given prominence by Braun-Blanquet himself, by being included in a treatise on the general aspects of plant sociology, intended for use as a text-book, and presenting usages that he would presumably approve if students were to accept them.

# A LETTER FROM DR. C. L. SHEAR TO WHOM WE DEDICATE THIS VOLUME

1707 North Sixth Street,
Monroe, Louisiana,
January 12, 1953

Dear Bartlett:

I am sorry to hear that you are not having better success in getting subscribers. I am enclosing a small check to help out. I cannot understand why institutions teaching botany should not all subscribe. Do they have no interest in the encouragement of the study of the subject?

I am enclosing some photos which I happen to have here, including the latest snapshot I had taken before I had to retire to the bed. There is one more early portrait published by Smith in his "Fifty Years Of Plant Pathology", 1927. I am also enclosing a small album prepared for me by Professor Whetzel. He sent it to me while he was studying in Germany. I think you will find some names and faces besides mine that you will recognize there. I like especially his "Pome" at the end: it was so spontaneous and sincere, and so characteristic of Whetzel. Too bad the dear boy had to be taken away in the prime of life. We used to have such good times, sitting around the fire after dinner, smoking those "strong cigars", and discussing all the mycological problems. He always followed Dr. Bessey's advice and kept his mind in a meristem condition.

Make as many copies as you wish of any of these that you care for, and return the originals to me.

I have received from Professor Porter of the Rocky Mountain Herbarium a copy of the label of the first specimen I collected of Carex Grayii. It is as follows:

HERBARIUM OF C. L. SHEAR
Carex Grayii Carey
Hab. Montross clearing, Alcove, N. Y.
Legit C. L. S. June 15, 1892.
19 Bailey

The Bailey reference indicates that L. H. Bailey verified the name. I was always fond of Carex.

There is an interesting story that may be in Mrs. Gray's Life and Letters of Asa Gray, stating that a young lady wrote Dr. Gray that she had collected a specimen of a species which did not agree with his description. He replied, "My dear Madam: I regret to say that I have never been able to make plants grow according to my descriptions."

The first Botany I ever saw or studied was Gray's "How Plants Grow," which was loaned me by a neighbor's son who had attended the State Normal School. I had never known before that nearly all plants of our country had been described and given Latin names. My mother, when I was a very small child, used to take me to the woods in the Spring to gather wild flowers. She was of Holland Dutch ancestry and used some of the Dutch names, such as "Paas blummies." I became infatuated with the subject: as soon as Spring appeared I found the earliest flowers and determined their names according to Gray's little book. I've never lost my enthusiasm for the subject since.

I hope you'll not get discouraged, but that you will eventually get the Bulletin on a self-supporting basis. My very best wishes for your success.

Cordially yours,

Cornelius L. Shear.

To my friend Shear

The tallest pathologist
The promptest mycologist
Lives down in D.C.
Whose smile is a treat
Whenever I meet
Him down there in D.C.

Whose job is a tall one
Tho the guy be a small one
Like most in D.C.
Tho his "smoke" they air strong
Stay his days, they be long
Down there in D.C.

And when I return to the
land of my birth
To the old U.S.A., the "Cop
of the Earth"
And its high spot, D.C.

I'm expecting to meet him
I hope I shall greet him
Still down in D.C.

W. H. T. Tehon

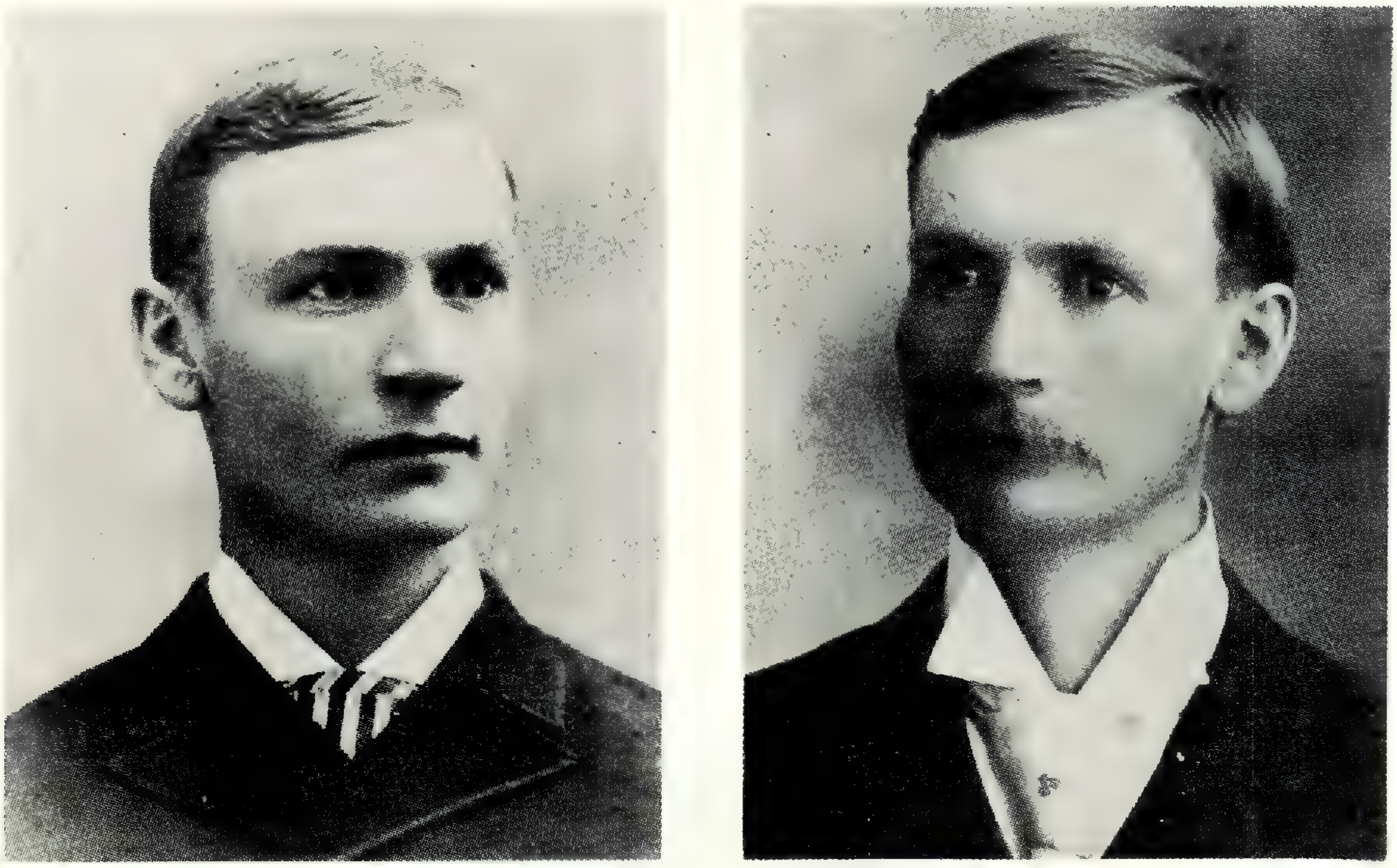
The Asa Gray Bulletin was founded by Dr. Cornelius Lott Shear in 1893, and he was its first as well as its last editor, with others in between. It appears that he may now be the only surviving charter member of the original group of young botanists who founded the Gray Memorial Botanical Association in 1887, as the Gray Memorial Chapter of the Agassiz Association, although it has not yet been possible to trace the careers of all of them.

"How Plants Grow," by Asa Gray, the book which Dr. Shear mentions as having launched him on his long and fruitful botanical career, was a pioneer and very influential elementary text through half a century. It was Part I (as published separately) of Gray's "Botany for Young People and Common Schools". The first edition appeared in 1858 and the last printing in 1900 or later. It included a "Popular Flora" which made it useful for reference in later life to those who had become fond of it as "young people" and had never graduated to the "Manual." It was usually facetiously referred to as "How plants grow gray."

Liberty Hyde Bailey's early botanical reputation arose from his work on Carex, on which he published a long series of short articles from 1884 to 1898, and his first major work, the "Preliminary Synopsis of North American Carices" in 1887. For a good many years Bailey was the last resort of those who wished help in determining Carices and probably most of the early members of the Gray Botanical Chapter of the Agassiz Association, including Dr. Shear, corresponded with him. Dr. Bailey's own early field work in Michigan was directed largely to the study of Carex, and is recorded in some of his first articles.

Before Shear specialized in mycology and became a recognized authority in that field, he had been a student of grasses, and, as Assistant Agrostologist in the Bureau of Plant Industry, U. S. Department of Agriculture, was the first professional botanist to whom the writer of these comments can remember ever having addressed a botanical inquiry. That was perhaps in 1902, and the letter was about the first recorded finding of Bromus brizaeformis in Indiana. Dr. Shear then sent me his recently published "Revision of the North American Species of Bromus", the first botanical publication that I ever received with the compliments of its author, and of course I still have it!

Most of us who are no longer young have vivid recollections of H. H. Whetzel, who died in 1944 at the age of 67, although Dr. Shear remembers him as perennially youthful. He was long Professor and Head of the Department of Plant Pathology at Cornell University. Like Dr. Shear, with whom he was associated in many activities of the professional societies, he had a way of becoming a warm friend of nearly all who had contacts with him. His characteristic and spontaneous poetastric appreciation of his good friend Shear was written in



Cornelius Lott Shear

Left: Picture taken at Albany, New York, 1887, before his graduation (1888) from the New York State Normal School.

Right: Picture taken at Lincoln, Nebraska, May, 1897, before his graduation from the University of Nebraska. In the same year he resumed joint editorship of the Asa Gray Bulletin.

white ink on the black pages of an album of snap-shots which he prepared as a memento of a phytopathological meeting (The Long Island Potato Disease Conference, 24-28 June 1919) which they both attended. Whetzel made up the souvenir album for Shear while on a trip to Germany, and sent it back from there. It contains pictures (with Whetzel's sprightly captions) of several American and foreign botanists, but most of them too small and indistinct for satisfactory enlargement and reproduction.

Shear's editorship of the Asa Gray Bulletin was only the first of his many connections with botanical publications. Few botanists have had longer or more useful careers. For many years after transferring from agrostology to plant pathology in 1898 he had charge of the mycological collections of the Bureau of Plant Industry, and had extensive contacts and correspondence with many botanists who passed on to him their problems of identifying fungi. He carried on this consultive and curatorial work until 1935, when he retired. He was then Principal Mycologist in charge of the Mycological and Plant Disease Survey, in which he remained active (as a Collaborator of the Bureau) until August 1950, when he was incapacitated, so far as physical exertion was concerned, by a heart ailment. Although bed-ridden, he is still very much interested in whatever is going on in botanical circles. Many

Cornelius Lott Shear in his office on the top floor of the "Old Red Building" of the U. S. Department of Agriculture in Washington, about Christmas, 1897. He was then Assistant Agrostologist in the Bureau of Plant Industry.

well-deserved honors have come to him. He was already "starred" in the first edition of American Men of Science, in 1906, indicating that even then he was considered one of the thousand leaders in American science. He held offices in the Botanical, Mycological and Phytopathological Societies, and was always a wise and faithful counsellor in all. Now we dedicate to him this first volume of a restoration of the little semipopular journal which he himself founded sixty years ago. It antedates his birthday, March 26th, but is nevertheless intended to convey to him best greetings for his 88th birthday not only from some who counted him a personal friend but also from younger botanists who know him only by reputation.

# THE COMPARATIVE REPRESENTATION OF MICHIGAN PLANTS IN CERTAIN HERBARIA

Claude Marvin Rogers

PLANT collectors have been in Michigan for more than a century, and though their activities have been sporadic, many specimens of Michigan plants have accumulated. A survey has been made to determine the distribution of a part of this material.

Specimens have been examined in the Gray Herbarium, the United States National Herbarium, the collections of the New York Botanical Garden, the Philadelphia Academy of Natural Sciences, the Chicago Natural History Museum, Notre Dame University, including the Father Hebert collection, the University of Michigan, Michigan State College, Wayne University, Cranbrook Institute of Science, including the recently acquired collection of O. A. Farwell, Aquinas College, including the Emma J. Cole collection, Albion College, Western Michigan College, Northern Michigan College, Michigan Normal, and the private collections of C. R. Hanes of Schoolcraft and R. R. Dreisbach of Midland. Thanks are due the curators of all of these herbaria for making their collections available and their cooperation is gratefully acknowledged.

As it was not possible to look critically at material in more than a few families, the order Geraniales was chosen for this survey. Included in it, according to the concept of Fernald in the recent edition of Gray's Manual, are the families Linaceae, Oxalidaceae, Geraniaceae, Polygalaceae, Rutaceae, Simaroubaceae, Zygophyllaceae, Euphorbiaceae, and Callitrichaceae. In Michigan there appear to be thirteen genera with fifty-three species and varieties. The Geraniales offer a good representation of flowering plants for in the order are large-flowered, often-collected species such as Geranium maculatum and Polygala paucifolia; common and widespread weeds like Euphorbia maculata and Oxalis europaea, as well as some species which are rare or have a greatly restricted range in Michigan, like Linum sulcatum, Geranium sphaerocarpon, and Polygala incarnata. In addition there are a few woody as well as herbaceous plants. The distribution of specimens in these families in the herbaria surveyed should reflect with fair accuracy the distribution of Michigan material of other families in these herbaria.

The accompanying table shows the distribution of the 2289 specimens seen (Column I). The three largest collections of Michigan plants are at the University of Michigan, Michigan State College, and the Cranbrook Institute of Science, which contain among them 55.4%

Table I

The distribution of Michigan Geraniales in certain herbaria. For each herbarium is shown in Column I the number of specimens seen and the percentage of the total number; in Column II, the number of county records included and the percentage of the total number; in Column III, the number of species included and the percentage of the total number.

| | Column I | | Column II | | Column III | |
|---|---|---|---|---|---|---|
| | Specimens | | County Records | | Species | |
| | Number | % | Number | % | Number | % |
| University of Michigan | 488 | 21.3 | 229 | 36.2 | 47 | 88.7 |
| Michigan State College | 386 | 16.9 | 252 | 39.9 | 46 | 86.8 |
| Cranbrook Institute of Science | 393 | 17.2 | 172 | 27.2 | 46 | 86.8 |
| Chicago Natural History Museum | 160 | 7.0 | 105 | 16.6 | 35 | 66.0 |
| New York Botanical Garden | 122 | 5.3 | 88 | 13.9 | 37 | 69.8 |
| Gray Herbarium | 115 | 5.0 | 88 | 13.9 | 41 | 77.4 |
| United States National Herbarium | 114 | 5.0 | 90 | 14.2 | 36 | 67.9 |
| Aquinas College | 112 | 4.9 | 66 | 10.4 | 33 | 62.3 |
| Wayne University | 100 | 4.4 | 80 | 12.7 | 34 | 64.2 |
| Notre Dame University | 99 | 4.3 | 42 | 6.6 | 29 | 54.7 |
| Albion College | 60 | 2.6 | 49 | 7.8 | 30 | 56.6 |
| Phila. Academy of Natural Sciences | 41 | 1.8 | 34 | 5.4 | 18 | 34.0 |
| Clarence R. Hanes | 39 | 1.7 | 34 | 5.4 | 32 | 60.4 |
| Western Michigan College | 29 | 1.3 | 28 | 4.4 | 26 | 49.1 |
| Michigan Normal | 20 | .9 | 15 | 2.4 | 15 | 28.3 |
| Northern Michigan College | 7 | .3 | 7 | 1.1 | 7 | 13.2 |
| R. R. Dreisbach | 4 | .2 | 4 | .6 | 4 | 7.5 |

of all of the accessible specimens. These and other Michigan herbaria contain 71.6% of the total, whereas the remaining 28.4% are in the out-of-state collections.

Though size is a useful criterion for judging the importance of a herbarium, the presence of numerous duplicates or near duplicates is not disclosed. Therefore the geographical distribution of each species in each herbarium was recorded by county, the county records totalled and tabulated in the accompanying table (See Table I, Column II). Important collections of the same species from different habitats in the same county are not shown by such a survey, but records of this sort may be generally used to reveal the diversity in each herbarium and thus indicate the usefulness of each collection in plotting accurate geographical ranges of the species in the state.

The 2289 specimens resulted in 632 county records. Of these the University of Michigan, Michigan State College, and the Cranbrook Institute of Science contain 72.5% while among all of the Michigan herbaria are 88%. It is interesting to note that by consulting the out-of-state herbaria only 76 new county records were added, less than 1.5 for each species.

Further knowledge of the diversity in a herbarium may be gained by counting the total number of species and varieties represented in the collection. This information is also shown in the accompanying table (Column III). No single herbarium contains all of the species, but all of the taxa in the Geraniales may be found in the Michigan herbaria. Although the out-of-state collections have a rather large number of specimens, they contribute no additional species or varieties.

Likewise, even if not evident from the statistics given, the out-of-state herbaria consulted have a considerable duplication of widely distributed collections, so that a census of their holdings brings rapidly diminishing returns. It is usually difficult to segregate Michigan material as such in these large herbaria whereas it is readily available in all of the local collections. It should be emphasized that there are a great many herbaria, in addition to the ones consulted, which contain Michigan plants. Some of these would add county records and occasionally, perhaps, a species otherwise unrecorded for the state, but it is clear that the local herbaria contain a good representation of Michigan plants and that an examination of other collections adds relatively little.

MAPS OF INDIVIDUAL MICHIGAN LAKES: AN AID TO PRECISION IN BOTANICAL WORK. — The Institute for Fisheries Research, Michigan Department of Conservation, cooperating with the University of Michigan, has started the publication of a unique series of maps which are sure to be of great utility to botanists and all other naturalists as well as to the fisheries biologists, management personnel and fishermen for whom they are primarily intended. So far, it appears that only two have appeared.*

The format is that of a four-page folder of about ordinary letter size, with title and "General Information on Lake Inventories" on the front, the map extending across the fold on the two inside pages, and

*Institute for Fisheries Research, Michigan Department of Conservation, cooperating with the University of Michigan. Lake Inventory Summary, No. 1, Higgins Lake, Roscommon (and Crawford) County. Summary by C. M. Taube, Junior Fisheries Biologist, 1 May 1951. No. 2, Gull Lake, Kalamazoo (and Barry) County. Summary by C. M. Taube, Assistant Fisheries Biologist, and E. H. Bacon, District Fisheries Supervisor, July 1952.

an "Inventory Summary" for the individual lake on the back. The map is tinted to show the general nature of the bottom, whether sand, or marl, or muck. Lake bottom contours are shown, and symbols indicate areas of floating, emergent and submergent vegetation. The nature of the shore is also indicated by symbols.

It goes without saying that these commendable maps will provide the basis for much detailed botanical survey work. Many collections of aquatic plants have already been made by the fisheries biologists, which will contribute importantly to the distributional data for aquatic plants in preparation of a new Flora of Michigan. After more of the maps have been published and they become more familiar, it is a safe prediction that they will be depended upon as an aid in recording all sorts of distributional data for the lakes and adjacent shores. There are 11,000 inland lakes in Michigan, of which 1800 have already been mapped, and biological surveys to provide the "inventory summaries" have been made for 500. If just a few of these were to be published promptly, covering representative lakes in each county, with some care taken to select the ones most available to college and university classes, much use would be found for them by teachers. Fourteen months intervened between the publication of the first two, in May 1951 and July 1952, respectively, but in any such enterprise it takes time to establish procedures satisfactorily.

Irving D. Scott's "Inland Lakes of Michigan" was published by the Michigan Geological and Biological Survey in 1921, and has long been out of print. It covered many of the important lakes and was an excellent beginning in the knowledge of our inland waters. The field work was done before the present network of good roads made so many lakes readily accessible, and of course a book is not adaptable for reference and annotation in the field as are individual maps, obtainable in quantity. The present project will be vastly more extensive if carried out, and the mapping will not only be more elaborate but will present much biological and chemical information, whereas Scott was naturally concerned with glacial geology and physiography. The unit style of publication should make it relatively easy to keep the present series in print.

Not the least useful feature of the maps is that they give full information about all places where the public has legal access to each lake, and where boats may be rented. As the series is continued, it will probably be desirable not to give up the whole of the front page repeatedly to reprinting the same general information, but to use that valuable space for extending the less easily available and more useful data about the individual lakes. Bolder and more easily distinguishable symbols would improve the maps for field use, but if others are ready for press, they should not be held up for changes that might not compensate for delay or added expense. — H. H. Bartlett

# THE NEW MICHIGAN FLORA, AN OPPORTUNITY FOR LOCAL BOTANISTS

Dale J. Hagenah

IN the first issue of the new series of this bulletin, a new Flora of Michigan was mentioned as one of the goals of the re-established Division C of the Gray Memorial Botanical Association. If it is intended, as it should be, that the flora shall show the known distribution by counties of each species and include only records substantiated by herbarium specimens, a new flora is a truly ambitious project. The preparation of such a flora would be a large order, even if there were adequate collections available from all 83 Michigan counties. But when it is realized that many counties are scarcely represented in herbaria, it is impossible to estimate the amount of field work alone which will be necessary.

We are accustomed to think of Michigan as a state which is thoroughly explored, but this is far from true botanically. Perhaps it would be useful to summarize briefly our present knowledge of the flora of Michigan.

Three floras or catalogues of the higher plants of the state as a whole have been issued. However, even at the date of the most recent one, compiled by Beal nearly 50 years ago, large portions of the state were still heavily forested and had not been botanized. Other large areas, scarred by lumbering operations and fires, seemed to offer little to interest the botanists of that day. The situation was fairly summarized by Beal in the Introduction to his Flora: "The study of the state at best can only be considered as fairly begun. By far the greater areas have not been seen by any systematic botanist and very few regions have been visited by one who is an expert in some one or more of the more difficult families."

The third and last Michigan Flora (Beal, 1904) was largely a revision of the second (Beal and Wheeler, 1892), which in turn owed much to the first (Wheeler and Smith, 1881). Although all of these authors had collected more or less extensively and had access to the various local herbaria, they relied heavily on local plant lists prepared by other botanists and by amateurs. Uncritical reliance on identifications by local collectors or on sight records by early explorers was bound to result in some inaccuracies in ranges given and species included. When due allowance is made for such inaccuracies, these floras have considerable value in that they show what the plant life formerly was in localities which are now intensively settled or cultivated. At present that is their chief value.

Turning to floras for smaller areas, we find some which may be

considered as reasonably complete for their time of publication, but several of these antedate the last state flora. The most recent and by far the best county flora is that for Kalamazoo County compiled by Clarence R. and Florence N. Hanes. This excellent work is up to date in nomenclature, well annotated as to distribution, and backed by a fine herbarium in which all critical identifications have been checked by experts. Other important county floras include those by Bingham for Oakland County, by Dodge for St. Clair County, and by Walpole for Washtenaw County. Brown is the author of a flora for Isle Royale National Park, and Cole produced an excellent flora of the Grand Rapids area (parts of Kent and Ottawa counties).

Plant lists have been published for a number of other counties or special areas, some as floristic studies and others as part of ecological studies. In general, these lists are subject to the criticism that they are based on inadequate collecting. The best of these are the Gates and Ehlers lists for the Douglas Lake region in Cheboygan and Emmet counties, but even here collecting has been more or less limited to the period of the summer sessions at the University of Michigan Biological Station. C. K. Dodge published lists for various counties or other areas but, with the exception of that for St. Clair County, most of his lists are based on a few collecting trips, usually made during only one or two summers. Although he collected extensively, voucher specimens are not available for many of the more common species which he includes, and he appears to have relied heavily on field lists. Darlington has published accounts of the vegetation of Gogebic County and the Porcupine Mountains, and both works contain large plant lists.

Certain other areas have been botanized quite intensively, some of them over a considerable span of time, but the data are either unpublished or scattered through a variety of published papers. An excellent summary of the botanical exploration of the state and the publications in which it was recorded up to 1945 is contained in the bulletin, "Taxonomic and Ecological Work on the Higher Plants of Michigan," by H. T. Darlington.

Insistence on voucher specimens for all records in a new Michigan Flora would eliminate many old published records that were based on sight records, on misidentified specimens, or on specimens that have been lost or destroyed. While many important collections are available in Michigan and elsewhere, anyone who has had occasion to refer to them knows that their coverage is extremely spotty, some counties being well represented while surrounding counties are not.

To obtain a rough index of the number of specimens actually available an analysis was made of the county records presented by two recent studies in which no record was admitted unless a voucher specimen had been seen and checked. These publications are "The Genus Carex in Michigan" (1941) by F. J. Hermann, with his recently published

"Additions" to it, and "Ferns of Michigan" (1952) by Cecil Billington (distribution records compiled by Stanley A. Cain). In addition to the principal herbaria in Michigan a number of others, including the Gray Herbarium and the U. S. National Herbarium, were checked in the preparation of the records for these specialized studies. Analysis of these records, then, should give a fair picture of the situation as a whole. If anything, the picture may be better than the general situation, because both publications deal with groups of plants which have been subject to considerable investigation by specialists.

In tabulating the records from these works each species or species-complex was treated as a unit. On this basis, records are available for the distribution in Michigan of 172 carices and 78 pteridophytes. Some standard was needed for evaluating the number of records in relation to the status of collecting in any county. From the number of species of Carex with widespread distribution it was concluded that any county might be expected to yield at least 40 species if a fair amount of collecting were done. This figure is probably far too small, since one well-botanized county, Kalamazoo, had records for 114 species. Applying the same idea to the ferns and fern allies, a minimum of 25 species was determined as being likely for any county. This is also probably too small, for in my own experience an hour or two of collecting in relatively small areas frequently yields 15 or more species of this group.

Applying these yardsticks to the records, one finds that only 21 counties have 40 or more records for carices, while only 33 have 25 or more records for pteridophytes. If the two groups are taken as a measure of a barely acceptable minimum of collecting, only 18 of the 83 counties in the state are adequately collected. These counties are: Berrien, Van Buren, Kalamazoo, Washtenaw, Wayne, Oakland, Macomb, Kent, St. Clair, Muskegon, Gratiot, Emmet, and Cheboygan, in the Lower Peninsula; Keweenaw, Houghton, Gogebic, Schoolcraft, and Chippewa, in the Upper. More critical examination of the records indicates that additional records are still possible even in these counties. A total of 47, or more than half of our counties, did not meet the minimum required to be classed as adequately collected in either group of plants. The following counties have less than 10 records in each of the two groups: Hillsdale, Mecosta, Bay, Lake, Missaukee, Ogemaw, Otsego and Montmorency. That the low numbers are due to lack of collecting rather than to sparseness of flora is shown by the fact that counties with large numbers of records are adjacent to counties with almost no records, even though their general physiography and flora are similar. An excellent example of this is supplied by Kalamazoo County and the seven counties surrounding it. There are 114 Carex records for Kalamazoo, while the seven surrounding counties can only muster a combined total of 139, or about 20 per county. The contrast would have been even greater except for the fact that 50 of the 139

records were the result of collecting by Mr. and Mrs. Hanes, who were responsible for most of the Kalamazoo records.

From the preceding summary it is evident that there are counties in all parts of the state which may be considered as botanically unexplored. Even the counties which are best represented in herbaria offer opportunities for the discerning botanist. An example of this is the finding of two additional species of ferns in Oakland County within the last five years -- and they were found not in some remote corner of the county but within a mile of the Detroit city limits. The collection of the voucher specimens needed as a basis for a really good Michigan Flora is an opportunity for the local botanist of the state to make a great contribution. The earlier Michigan Floras combined the results of long hours of field work by a large number of field botanists, all of whom added to the general knowledge of plant distribution. The opportunities for such work are still abundant and waiting for those botanists who are willing to accept the challenge of the botanically unexplored areas.

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COMMENT ON MR. HAGENAH'S PAPER: THE COLLECTION OF VOUCHER SPECIMENS. -- We think that Mr. Hagenah has made an excellent point here, and anyone can confirm his conclusions in a few minutes by inspection of the specimens in any of the major herbaria of the State. Generally speaking, the counties outside of a few well-collected areas are pitifully represented in herbaria. We should like to say a few words editorially, however, about the means of improving this situation.

In general, as Mr. Hagenah says, it is thoroughly unscientific to admit into a good Flora any records of plant-distribution except those which can be verified; i.e. those which are backed by a preserved specimen of the plant in question, so that its identity can be checked from time to time, if necessary, as changing concepts of species make this desirable. In early days of botanical work in America, for example, European species were commonly reported from various places in the eastern United States. Even in the absence of voucher specimens, we now suppose most of these reports to have been based upon American

species which resembled the European ones but which were not identical with them. Even so, in some cases the European species were later introduced into America, thus creating a difficult situation for the botanist. Without an actual specimen one cannot accept an early report of such a species, for it is impossible to tell whether the person making the report had in hand the native American species or the European one.

The answer to this problem, as far as the Flora of Michigan is concerned, seems simple: collect and preserve the desired material from areas which are now poorly known. There is one catch to this, namely that specimens of vascular plants must be carefully prepared and as carefully preserved, and unless this care is taken, no curator today can afford to give the specimens herbarium room. All good herbaria today welcome additional good specimens, especially those which are from interesting new localities or which demonstrate plant-parts that are not ordinarily preserved. Most herbaria, however, both good and bad, today are overcrowded with inferior specimens which the curators are tempted to regard as "hay" and discard accordingly. We realize that when one dries a plant-specimen it is susceptible to mold; the leaves drop off; the flowers turn black; the roots break off when it is pulled out of the ground; perhaps a cow has just chewed off the top of the plant; after drying any plant becomes brittle, and shattered specimens resembling green pipe-tobacco are not infrequently seen.

With a little care all these things can be overcome. Rapid drying of specimens will preserve the natural colors and prevent molding and dropping of leaves and flowers. Anyone with a little interest in the subject can remember to avoid sterile specimens (with only a few exceptions) and select plants which have on them fruits or flowers or both. Most curators of herbaria have very definite ideas about how a specimen should be made, and anyone who intends to prepare any considerable series of plants for deposit in a herbarium should consult the curator for advice about this. There are a number of good published papers on the subject of preparing herbarium specimens. One of these, called "The Preparation of Botanical Specimens for the Herbarium", by I. M. Johnston, has been distributed free by the Cambosco Scientific Company, Brighton 35, Mass., and anyone who is interested can secure a copy as long as the supply lasts. In the new "Taxonomy of Vascular Plants" by G. H. M. Lawrence (The Macmillan Co., 1951) there is a whole chapter (pp. 234 - 262) devoted to "field and herbarium techniques", and the author cites at the end of this chapter a number of references to published articles on methods and techniques.

Let us by all means have increased and continued interest in the voucher specimens for the Flora of Michigan, but let us also remember that in this field of activity as elsewhere, there is no substitute for quality! — Eds.

# BOTANIZING IN TOROWEAP VALLEY IN NORTHERN ARIZONA

Elizabeth McClintock

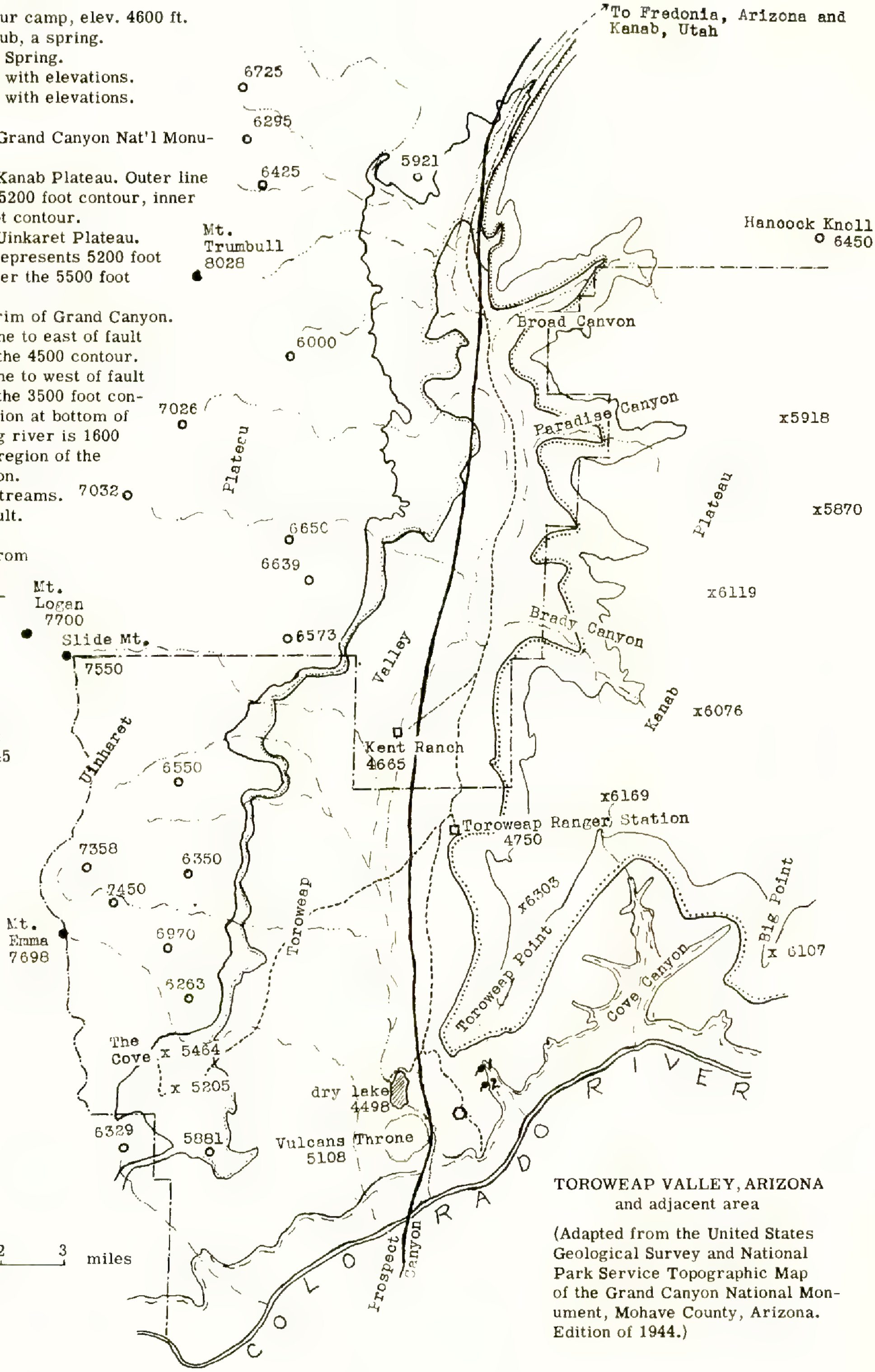
TOROWEAP VALLEY, or Tuweep as it is sometimes called, is located in the western part of the Grand Canyon National Monument in northern Mohave County, Arizona. It is north of the Colorado River and within the region sometimes called the Arizona Strip. The monument, which lies immediately to the west of Grand Canyon National Park, has not been developed for recreational purposes and has no facilities for tourists. The monument headquarters are 65 miles from Fredonia, the nearest town, and reached over a road, which while a good enough dirt road when dry, becomes impassable when wet. The comparative inaccessibility of the area together with lack of tourist facilities has kept it from being explored botanically. For this reason it seemed to be a most desirable area for a collecting trip and when Dr. Walter Cottam of the University of Utah asked me to join him and Mrs. Cottam there in April, I was most happy to do so. We arrived on the 19th of April and stayed for three weeks. We set up a base camp in a wonderfully scenic area about one mile from the rim of the canyon. Our collections included about 250 species, and of these 22 were new to Mohave County, four were new to Arizona, and one is perhaps an undescribed species.

Toroweap Valley runs in a north to south direction and is about three to five miles wide and twenty miles long. Although it ends abruptly at the north rim of the Grand Canyon, it has a counterpart on the south rim called Prospect Canyon. It is located between two high plateaus: On the east is the Kanab Plateau which rises to slightly more than 6,000 feet, and is a more or less level area except to the southwest where there are several cinder cones. The Uninkaret Plateau on the west side of the valley is a more diversified area, with elevations of about 5,000 feet along the eastern margin and 6,000 to 7,000 feet along the western margin. Rising above the general level are three peaks, Mt. Trumbull, 8,028 feet, Mt. Logan, 7,700 feet, and Mt. Emma, 7,698 feet. In addition there are numerous cinder cones scattered over the plateau.

The road into Toroweap Valley from Fredonia parallels the Permian cliffs or escarpment forming the western boundary of the Kanab Plateau. In places this precipitous escarpment rises as much as 1,000 feet above the valley floor. Rocks of several formations are found in these cliffs. There are limestones, shales and sandstones of the Hermit, Coconino, Toroweap and Kaibab formations. The resistant limestone forms the upper surface of the Kanab Plateau, except for the

Legend

- Location of our camp, elev. 4600 ft.
- Devil's Bathtub, a spring.
- Saddle Horse Spring.
- Cinder cones with elevations.
- x Bench marks with elevations.
- ---- Road.
- —·— Boundary of Grand Canyon Nat'l Monument.
- ····· Boundary of Kanab Plateau. Outer line represents 5200 foot contour, inner the 6250 foot contour.
- ·· Boundary of Uinkaret Plateau. Outer line represents 5200 foot contour, inner the 5500 foot contour.
- – – – Boundary of rim of Grand Canyon. Boundary line to east of fault represents the 4500 contour. Boundary line to west of fault represents the 3500 foot contour. Elevation at bottom of canyon along river is 1600 feet in this region of the Grand Canyon.
- —— Intermittent streams.
- —— Toroweap Fault. Location of fault taken from map accompanying "Geology of Uinkaret Plateau" by E. D. Koons, Bull. Geol. Soc. Am. 56: 151-180. 1945




TOROWEAP VALLEY, ARIZONA
and adjacent area

(Adapted from the United States Geological Survey and National Park Service Topographic Map of the Grand Canyon National Monument, Mohave County, Arizona. Edition of 1944.)

Fig. 2. Looking west from near our camp site in the Toroweap Valley, showing shrubby vegetation of the red sandstone, Vulcan's Throne in right background and rim of the Grand Canyon in the far distance.

cinder cone areas. About two and one-half miles from the rim of the canyon this escarpment turns abruptly eastward to form the southern boundary of the Kanab Plateau. This junction is marked by a massive, promontory-like bluff called Toroweap Point. The rocks which extend into the valley from the base of the escarpment along both boundaries of the plateau are made up of the colorful red sandstone of the lower portion of the Hermit formation. On weathering these rocks form the red soil so characteristic of this region. This red sandstone forms the floor of the upper, outer canyon which is called the Esplanade. It is the only prominent bench in this region of the Grand Canyon and is developed at a different stratigraphic horizon from other benches in the canyon, such as the Tonto Platform to the east and the Grand Wash Platform to the west.

The Esplanade, or outer canyon, is a colorful and rugged area. It contains many more or less flat pavement areas separated by shallow bluffs and ledges with scattered trees and shrubs. In some places these areas have shallow depressions which become filled with water during rains. There were several of these close to our camp and we found them handy sources of water; though shallow one could even bathe in them. There were two springs in a side canyon close to Toroweap Point, the only springs in this part of the canyon, but they were too far from camp to be used as a source of water. Crossing the Esplanade, one comes abruptly to the rim of the Grand Canyon from which, at its elevation of 4,600 feet, is seen the Colorado River 3,000 feet below. The walls in this region are steep and sheer with abrupt rock ledges jutting out in some places, and descent to the bottom of the canyon would be impossible.

An outstanding feature of the Grand Canyon in the Toroweap region is the remnants of volcanic activity on the Uninkaret Plateau. This activity was extensive enough to change the topography of the plateau as well as that of the southern end of Toroweap Valley. Numerous cinder cones occur in this part of the valley, the most prominent of which rises about 500 feet from the valley floor and was named Vulcan's Throne by the geologist, C. E. Dutton, who visited the area in 1880. According to E. D. Koons (Bull. Geol. Soc. America 56: 151-180, 1945) numerous lava flows issued from more than 160 craters on the plateau. This activity was demonstrated to have occurred in four stages, the first in late Miocene or early Pliocene time and the latest "so recently that no modification of the cone or flow is apparent" (Koons). There are also lava flows in the canyon and it is thought that one or more of these reached the river and may have dammed it or ponded it for some distance upstream.

There is only one place in the Toroweap region of the Grand Canyon where it is possible to descend to the bottom of the canyon and the Colorado River. Along the canyon wall at the foot of Vulcan's Throne are cascades of lava which have poured down from the rim. Along

Fig. 3. Right half of panoramic view of Toroweap Valley, looking north from the top of Vulcan's Throne. The promontory on the right is Toroweap Point.

Fig. 4. Left half of the same panoramic view of Toroweap Valley as Fig. 3. In the right foreground (left foreground in Fig. 3) is a dry lake, and beyond it a cinder cone.

Fig. 5. Inner gorge of Grand Canyon from near the base of Vulcan's throne, Toroweap Valley, Mohave County, Arizona, looking west. Lava boulders are characteristic of this portion of the Canyon. Yucca Whipplei (called Yucca Newberryi by Mrs. McKelvey).

these lava slides is a trail but it is hardly one to be recommended for as Dutton (U. S. Geol. Survey, Monograph 2, 1882) says: "The way is difficult and at times well calculated to daunt the most active climber. The wall is here much broken down and the vertical face has given way to a very steep slope." It is the roughness of the lava rocks, however, which gives the hiker a foothold in the steep places, particularly near the bottom of the canyon. As I climbed down and then back up I kept wondering whether it was easier to go down or to come up; I never did decide. But it was worth the effort not only for the plants collected but for the wonderful scenery and most of all the sight of the muddy Colorado River as it goes so swiftly along.

Toroweap fault, one of the major displacements of the Colorado Plateau province, follows the course of the valley in a north to south direction. Koons traced it for a distance of about 30 miles from its northernmost point, where it joins the Sevier fault, southward to the rim of the canyon. It crosses the canyon just to the east of Vulcan's Throne and continues southward into Prospect Canyon for some distance.

From these remarks on the topography of Toroweap Valley it may be surmised that there is a diversity in the vegetation of the area. This surmise is true, for although there are species which occur on both the lava and alluvial deposits of the valley floor and the sandstone of the Esplanade, certain ones are found on only one or the other of these areas. The vegetation of the sandstone area is largely a mixture of pinyon pine, juniper and a number of shrubby species, some of which are constituents of Arizona's chaparral. On the alluvial and lava deposits the vegetation is largely sagebrush, with pinyon and juniper present in certain places but not in others.

While Artemisia tridentata, the Great Basin sagebrush, is often dominant in the sagebrush area there are places where it gives way to other things. In the vicinity of the Cove in the southeastern end of the Uninkaret Plateau it was particularly abundant. Some of the woody species associated with it here were Ephedra viridis and Purshia tridentata and scattered shrubs of Amelanchier utahensis and Fendlera rupicola on the steeper slopes. Also in this area were scattered junipers which extended onto the floor of the valley for some distance. In the area of the Cove itself were pinyon pines as well as junipers. On Vulcan's Throne there were no trees, and the amount of sagebrush varied on the different exposures. In some places it was dominant and in others not so. The principal woody species in addition to sagebrush were: Hymenoclea Salsola, Prunus fasciculata, Thamnosma montana, and Yucca baccata. Others of less frequent occurrence were: Aloysia Wrightii, Salvia carnosa, Salazaria mexicana, Krameria parviflora. In the sandy wash along Toroweap fault on the east side of Vulcan's Throne were found: Quercus turbinella, Ptelea pallida and Fallugia paradoxa. In the Spring, while we were there, many annuals and

herbaceous perennials were in flower, which gave a great deal of color and diversity to the vegetation of this area. Some of these were: Phacelia glechomaefolia, Mentzelia pumila var. integra, Astragalus lentiginosus var. vitreus, Baileya pleniradiata, Castilleja chromosa, Calochortus flexuosus and Rumex hymenosepalus. It is interesting to note that in the vicinity of Vulcan's Throne were found three plants not previously reported from Arizona. These were: Oenothera pterosperma, Antirrhinum Kingii and Psathyrotes annua.

The sandstone area of the Esplanade which is to the east of Vulcan's Throne and between Toroweap Point and the rim of the Grand Canyon had pinyon pine (Pinus edulis) and juniper (Juniperus monosperma) and a number of shrubs. Some of the more common shrubs were: Quercus turbinella, Ceanothus Greggii, Rhus trilobata, Berberis Fremontii, Cowania mexicana var. Stansburiana, Glossopetalon nevadense, Thamnosma montana, Bernardia incana, Yucca baccata, Agave utahensis, Nolina Parryi, and Ephedra viridis; others of less frequent occurrence were: Arctostaphylos pungens, Cercocarpus intricatus, Shepherdia rotundifolia, Symphoriocarpos longiflorus. During the spring there were many annuals and herbaceous perennials in flower, just as on Vulcan's Throne. Some of the more colorful of these were: Cryptantha confertiflora, Castilleja chromosa, Lesquerella arizonica, Phacelia glechomaefolia, Lepidium montanum var. Jonesii, Phlox austromontana subsp. prostrata, Layia glandulosa, Oenothera lavandulaefolia, Penstemon Eatonii, and Rumex hymenosepalus.

The two springs, Saddle Horse Spring and the Devil's Bathtub, near Toroweap Point, had several interesting plants. Growing under the limestone ledges at both was a white flowered species of Phacelia, P. laxiflora, and Petrophytum caespitosum, a mat-like plant not in flower while we were there. Perhaps because of the small amount of rainfall during the past several years the Phacelia colonies appeared to be dying out. However, around some of the dried-up plants there were many young seedlings. The seedlings may be accounted for by the greater than usual amount of rain during the past year. Two ferns which turned out to be new records for Mohave County were found at the Devil's Bathtub. These were Notholaena sinuata and Pellaea limitanea. Carex curatorum, found at Saddle Horse Spring, has heretofore been known only from the type locality near Roaring Spring in Grand Canyon National Park.

The vegetation of the inner gorge of the Grand Canyon is a desert type with plants characteristic of the deserts of both Arizona and California. Some of the woody species were: Larrea tridentata, Franseria dumosa, Yucca Whipplei (Y. Newberryi), Encelia farinosa, Fouquieria splendens, Encelia frutescens, Peucephyllum Schottii, Hofmeisteria pluriseta and Dyssodia porophylloides. At the bottom of the canyon along the river were found: Acacia Greggii, Baccharis Sarothroides, and Prosopis juliflora. There were a number of annuals and

Fig. 6. Yucca Whipplei near the base of Vulcan's throne, inner gorge of Grand Canyon, Toroweap Valley, western part of Grand Canyon National Monument, northern Mohave County, Arizona.

Fig. 7. Toroweap Valley, looking southeast from the cinder cone, Mt. Trumbull Cove, showing sagebrush vegetation in the foreground, Vulcan's Throne beyond the left middleground, and the cliffs of the south rim of the Grand Canyon in the background.

herbaceous perennials but they were not as abundant or as colorful as those outside of the canyon. The distribution of the various species within the walls of the canyon changes with exposure and elevation and the accompanying temperature differences. It would be of interest to note the altitudinal ranges of at least the more abundant species within the canyon and then compare the results of such a study in the Toroweap area with other areas in the Grand Canyon.

As in any arid region, the amount of rainfall has a striking effect on the vegetation. During the past several years the rainfall has been somewhat less than the average of ten inches per year, but during the past year of 1951 the rainfall was fifteen inches. For this reason the spring of 1952 was a most favorable season for collecting in this region. The annuals were particularly abundant both in kind and number. Although another season may not be so favorable from this standpoint, I believe that it would be profitable to return there and to collect in some of the other parts of the Monument area.

California Academy of Sciences

San Francisco 18, California

The photographs in Miss McClintock's article were taken by Professor Cottam and are used with his permission. — Eds.

# MEXICAN BOTANICAL EXPEDITION OF 1952

Rogers McVaugh

## II. Progress report for late September and early October[1].

In camp, on the Nevado de Colima,
at 8000 feet, October 12, 1952

Dear Uncle Harley:

It has been almost a month since we wrote you before, and we are back here on "The Mountain" after an enforced vacation because of rain. The last two weeks in September it cleared up beautifully nearly every morning, but clouded up and rained a few hours every afternoon. We found a nice ungrazed area in the pine forests of the Sierra del Tigre, at about 7000 feet, near Mazamitla, Jalisco, and "commuted" 30 miles a day for nine days to the Hotel Palmira, at Jiquilpan, Michoacán, on the Mexico City highway. In this way we managed to beat the rains and get our plants dry every night, and we got pretty thorough coverage of the flora in the Mazamitla area. We found about 300 species in flower or fruit in the pine forest, including a good many things like Utricularia, Isoetes and Eriocaulon, which grow in special habitats.

We came back here to the volcano on September 25, but found a pall of cloud hanging over the whole highland above about 8000 feet, and in the afternoon it rained even in the dry lowlands, so we went back to Guadalajara for a few days and made some good collections in the mountains about 25 miles south of the city. We also spent some time doing a bit of amateur mapping around the city, locating the small settlements visited years ago by Palmer and Pringle. Río Blanco, for example, was the site of important early collections by both Palmer and Pringle, but today it does not appear on any ordinary map and is very hard to locate. The reason, it seems, is simple. Río Blanco was never a town in the ordinary sense, but at the time of Palmer's visit (1886), and for some years thereafter, it was the site of a big cotton mill. It has now fallen into disuse, and although less than 10 miles from the center of Guadalajara, it is not easy to reach by road. This to me is one of the amazing things about Guadalajara (and indeed other Mexican cities). Here is a city of about 300,000 population. You can go a few hundred steps outside the city on any side, and you step from densely crowded city streets into cornfields -- the city stops abruptly

[1]The first letter of this series was published in ASA GRAY BULLETIN, n.s. 1: 295-297. 1952. -- Eds.

as if it were walled in. No thriving suburbs, no roads, nothing but the back country. Three or four miles from the center of the city is the great barranca of the Río Santiago — an immense gorge two miles or more wide, nearly 2000 feet deep, and perhaps 200 kilometers long — and nobody knows it's there. No road leads one to it — no decent road — and no tourist throws beer cans into it! We went the other day to Huentitán de Abajo, the tiny decaying village at the head of mule travel into the barranca, and saw the steep old road that descends and comes out on the other side -- the old and formerly only road to Aguascalientes.

We came back here to the Nevado de Colima on the 9th of October, and went up and camped at about 9300 feet, in a cut-over fir forest. A good many things had come in to flower since our first visit, including a big Buddleja with orange flowers which is one of the principal deciduous trees of this upper forested zone. The "weeds" of the cut-over fir forest are mostly big shrubs 12-15 feet high, and many of them are flowering now. The most abundant of all is a very showy scarlet Salvia with flowers nearly 4 inches long. As you may imagine, the hills are quite a sight, with this big Salvia, the tree Lupine along the trails, and various other species of Eupatorium, Cestrum, Solanum and Holodiscus in flower too.

In spite of all the color, the number of species involved is not very great, so after being rained on one night and freezing to death another, we came down here into the pine-oak zone which goes up about to 8500 feet on this side of the mountain. Here and below the firs drop out of the barrancas and are replaced by deciduous (or at least broad-leaved) trees: Quercus, Tilia, Carpinus, Cornus, Arbutus, Eupatorium, Prunus, Garrya, Symplocos, Meliosma and others. The number of species here is much greater, and the climate is warmer!

We were out collecting all morning and the presses are drying, so I have time to write a little. Our camp here is one of our best so far. We are in pine woods with water nearby, and our view overlooks the whole valley of Zapotlán, 3000 feet below us. We are on an old road which is too steep for wheeled vehicles to come up, so traffic is light. The only drawback is the fact that we are on the northeast side of the mountain and the sun goes down on the southwest. As I write, now at 4:30 in the afternoon of a beautiful clear warm day, the sun has gone behind the hill and we are in shadow although the valley will have sun for an hour or more. It is cold enough here so that we wear sweaters and jackets all the time, and this minute I am hugging a good campfire.

One of the lessons all good field botanists should learn is that you always use more drying equipment than you think you will. We have used, for example, more than 100 pounds of newspaper already, and we use kerosene at the rate of six quarts a day! We have been using soap boxes to pack the dried specimens in — soap in Mexico is

sold in wooden boxes about 6 inches deep and exactly the right size for our specimens. We get them in the city markets, at prices ranging from 25 centavos to one peso, and as they are usually brought in new and unpacked on the spot, they are usually clean.

Must go gather a bit of firewood now. Best wishes for yourself and the A. G. B. Joe sends regards.

Sincerely

Rog

## III. Trip to the summit of the Nevado de Colima

In camp, on the Nevado de Colima,
at 12,000 feet, October 29, 1952

Dear Uncle Harley:

It always seems to be here on the Nevado that I have a bit of time for letters. This time we are making a concerted effort to reach, if not the summit, at least the talus slopes and rock-faces which surround the peak, above the limit of the pines and bunchgrass. We camped last night at 8,000 feet, in company with our friend Ing. Agustín Gómez y Gutiérrez, the head of the Departamento Forestal in Jalisco. This morning we met our guide, Francisco Chávez, who was waiting for us with 2 pack horses at the upper end of the lumber road. Last month when we wrote you we could drive up nearly to Leoncito or to over 10,000', but recent landslides have so worsened the road (or decomposed it, as the Spanish has it), that now we can only get to 9200 feet, but still in the fir zone. We packed the horses with essentials for 2 days, including a press, sleeping bags and groceries, and came up here by easy stages, arriving at 3 p.m. We began to see frost on the ground at about 9000 feet and up here the ice-crystals are frequent and the ground is frozen where it gets no direct sunlight. We came through the zone of zacatón, or bunchgrass with big alders, and are here in a pure stand of pines 1 to 2 feet in diameter and 30 to 50 feet tall. We are camped in a little level place, on pine needles, at a "pozo" or pit which was dug in years past to trap snow for the market in Zapotlán, 15 miles away and a mile down.

The flora here is very poor in species. Pringle was certainly right when he wrote years ago that the upper slopes of the Nevado de Colima were hardly worth his while. The one pine is the only arborescent species, which in itself seems noteworthy. There are no other trees and no shrubs. There is one big bunchgrass (genus ignotum) which is very common, and a few other grasses. The big Lupinus which is sometimes shrubby is here but not very happy. The only other herb which is general is Senecio toluccanus, which is common here as at high elevations

on most of the other big peaks in Mexico. In the few places where the thick carpet of duff is broken the bare volcanic gravel supports the rosettes of Draba xorullensis and about 3 species of the Caryophyllaceae. And that is apparently all! Tomorrow night we hope to be able to tell you what is above the pines.

Fig. 1. The summit of the Nevado de Colima, viewed from the west. The only practicable means of ascent of the peak is by the gently sloping gravel ridge at the right. From a kodachrome taken March 27, 1949, at an elevation of about 3750 m.

Since the last letter Joe and I have spent a week in the oak-pine forests between Ayutla and Mascota, in western Jalisco at middle elevations (6000 to 7000 feet). The road had dried up just enough, after 2 weeks of the dry season, to enable us to get through it. We found a good series of the ephemeral wet-season plants still in flower. One of the most interesting habitats was in soil 2-3 inches deep, over level or gently sloping rocks, in a pure forest of Quercus macrophylla. The leaves of this oak actually get to be a foot long, and they are very thick and stiff, so walking through a pile of them is like walking over shingles. We found an Isoetes here, at its best at the edges of the piles of oak leaves, apparently where it could persist to come through the pile of leaves, but less hardy dicots and the grasses could not. Farther down the road, in the pines, we followed up a fine creek and found Podostemaceae, which are always exciting, more Utricularias, Begonias, and many things we didn't know at all. No firs here at 7000 feet,

but lots of Pinus lumholtzii, which they call "triste" because of its strange stiffly drooping needles.

It's 4:30 now and the sun has dropped below the rim, so in spite of the fire my fingers are too stiff to write more.

October 30. 6:30 p.m.
in the same camp

We have finished supper and have a few minutes of daylight. We have been to the summit and back, with a minimum of trouble, so we are feeling quite smug tonight. When we got to the top we set our altimeter for the known height, 14300 feet ±, and now we think perhaps this camp is at 13000 feet instead of 12000 as we told you yesterday. At any rate the ice froze hard in our water bucket last night, and we are eking out our meager supply of water with about 50 lbs. of icicles from a nearby cliff.

The ascent is very easy, really; three hours from here, and almost no rock climbing.

The flora above here is very sparse. The pines stop about 13500 feet, and above that the only woody plants are junipers which plaster themselves to the rocks all the way to the summit, and a little Vaccinium about 6 inches high which grows in the gravel slopes. At and near the summit we counted just 12 species: the juniper, 3 grasses, a Luzula, Draba xorullensis, Senecio toluccanus, Arenaria frigida and another Caryophyllacea, an Alchemilla, a Potentilla and a yellow woolly Gnaphalium. With minor additions, this is the whole flora of nearly the top 1000 feet of the mountain. It is very dry, perhaps mostly because of the volcanic gravel which absorbs water very rapidly, and not until one descends into the barrancas at 11000 feet and below does he find many species.

Tomorrow we plan to descend to a lower camp and get to our car again, and Saturday we hope to go to Manzanillo for a shot at some mountains north of there.

Best regards
Rog

## IV. A Cloud Forest in Jalisco

In camp, Nov. 4, 1952

Dear Uncle Harley:

¡Viva Ruiz Cortines! ¡Viva Eisenhower! This time, for once, I am

not writing from the Nevado de Colima. We are camped in a rain-forest, or cloud-forest (drying off from a thunderstorm that hit us about noon), about 50 miles north of Manzanillo, Colima, but actually in Jalisco. The mountains here seem to have no name; we were told that they are called only "Sierra de los Aserraderos del Pacifico." [We found later that the name Sierra de Manantlán is an accepted name for this range. -- R. McV.] The lumber company which is cutting off the pine has built a road up here, and we are enjoying the benefits. The road itself is quite a marvel, at least in the last ten miles. You go from 3400 to 8400 feet in a series of hairpin curves that go up so steeply that our vehicle refused them except in the crawler gear. We enjoyed the trip especially because we had come directly from the hot dry tropics of Manzanillo to pass directly into pine-covered hills at 3500 feet or a little more, then a half-hour later into the cloud-forest with big firs at 6500 feet, and finally into a wet mixed forest where the big pines predominate on an elevated plateau.

Nov. 6 (Continued)

I was cut off day before yesterday by a shower, and today we are waiting out another thunderstorm, this time in the truck. Tuesday we were out collecting when the rain began, and of course we were unprepared, for the rainy season ended October 15. We rushed into camp and rigged a canvas over the driers, and spent the rest of the day drying our clothes and the plants. Yesterday no more rain, but clouds drifting through all day.

The cloud-forest is really the most impressive thing of its kind we have seen. All the trees, including the big firs, are covered by a thick mat of mosses, lichens, and liverworts. Sometimes a branch an inch thick will appear 3 or 4 times its size because of its covering. Most tree-trunks, including rough and smooth ones, and both erect and leaning ones have a good many epiphytic vascular plants. Ferns, of course, are most abundant, and include a good many species of Polypodium, and various other genera: Elaphoglossum, Asplenium, Lycopodium (looking like a bunch of strings hanging from the tree). Tillandsias are abundant, and so are many species of orchids (now mostly sterile), and one big epiphytic cactus that looks like a rope hanging 15-20 feet out of the branches. There is a Sedum, too, and of course you find other plants occasionally. The whole place is damp, and after 3 days of breathing fog we can see why.

The forest itself is an intriguing mixture. The firs are the biggest trees (up to perhaps 5 feet in diameter, and 125 feet high), but it is not by any means a fir forest, -- in fact the broad-leaved trees predominate. Our own Ostrya virginiana is perhaps the most common, and very large (up to 3 feet in diameter). Then there are oaks, Tilia,

Meliosma, Styrax, Symplocos, Cornus, Ternstroemia and Alnus. All these become large trees, and all are abundant. There are almost no pines. The mixture is what you might find in a deep moist barranca on the Nevado de Colima at the same elevation, but very locally. Here, apparently because of the clouds pushing over all the time, it spreads over the whole mountainside.

Nov. 9 (continued) from Guadalajara

As the rains continued in our cloud-forest camp, and the lumber-trucks began getting stuck on the way up ("con mucho patinando," as they say), we moved down to another camp, this time in the pine-forest zone at something less than 6000 feet. Here the firs are absent, and there has been relatively little cutting because the slopes are very steep and hardly any of the pines run more than 3 feet in diameter, so I presume lumbering does not pay. There are a few oaks, but otherwise almost a pure stand of pines on the hills where exposure (S & W) is greatest. There is little underbrush, but the perennial herbs are many and varied. Genera which predominate are Stevia, Eryngium, Cacalia, Cuphea, Crotalaria, Andropogon; there are also many individuals, but fewer species, of Penstemon, Lobelia, Polygala, Ranunculus, and of course a good many we do not know! On the whole, however, the aspect is not very different from pine forests at home. In the barrancas here, however, even at 6000 feet or higher, you step right into the tropics (except for Carpinus and Ostrya, which seem supremely at home alongside of such things as Ardisia and Clusia and Saurauia). Our biggest find, however, was Podocarpus, which is abundant in these barrancas, and apparently very much at home and seeding freely.

In spite of all this interesting botanical stuff, we had to come down yesterday because the rains continued and we unexpectedly ran out of newspaper! We had more collections than we had thought to make in a week, and paper turned out to be the factor limiting our stay. We plan to go back after the rains are over, perhaps early in December. The rain-pattern here in the southern mountains is an interesting one: nights are beautifully clear and starry (but the Big Dipper is invisible because it is so low in the North, and this month is down instead of up at night!), and the early mornings are fine and sunny. At 10 or 11 the clouds begin to obscure the sun, and rain comes, often with much thunder, from 11 or 12 to 2 or 3. After that it is dark and cloudy, although in an inefficient sort of way, with patches of bright blue here and there, until after sunset. As soon as it begins to get dark the clouds disappear as if by magic and the stars come out. That was the pattern for a week, so we got to follow it for all our activities of eating, sleeping, and working.

Best regards, as ever
Rog

## V. A Trip to Talpa and the Sierra de Cuale, Jalisco

In camp, in the Sierra de la Campana,
Jalisco, November 23, 1952

Dear Uncle Harley:

One of our main objectives this year was to spend a few weeks in the Sierra de Cuale in far western Jalisco (long. W. 105), southwest of Talpa de Allende. Some of its peaks go over 9000 feet, and no botanist has ever been there, except that Nelson collected a few specimens near Talpa in the course of zoological work years ago. Unfortunately for us, the only road into this part of Jalisco (that from Ayutla) is impassable for ordinary vehicles from May until late October. We came in as far as we are now (30 miles, or 4 hours) from Ayutla just a month ago, but at that time the buses did not run to Talpa and Mascota, and where the Mexican bus runneth not, there go we neither. Now the buses are running, however, and at this late date we managed to get to Talpa last Tuesday, the 18th. Talpa itself is a very attractive little town, with clean cobbled streets and houses in good repair. We arrived in the afternoon, and without any trouble found a man who would supply us with pack animals for the trip. We started early Wednesday morning, with 2 pack mules loaded with presses, lanterns, kerosene, sleeping and cooking stuff, and food. Joe had a horse with no bit or bridle, but an insatiable appetite, so he had a bit of trouble keeping up with the crowd. I rode a mule of rather low stature, so that my feet were about 6 inches off the ground, and I had a bit of trouble when we went through deep ruts and over rocks. Our muleteer, packer, and guide, a youth of some 25 yrs., one Salomé Moreno, rode a horse. He constantly encouraged the pack mules with two epithets, both unprintable. I thought one of them was interesting etymologically: freely translated it means a "she-billygoat."

It turned out that Salomé didn't know anything at all about the country we were going into (a great rocky peak, surrounded by wooded mountains, that sticks up conspicuously about 20 km. west and a little south of Talpa). Fortunately we met a man on the road who lived right in the area we wanted to visit, and who was returning from a visit to Talpa. He offered to guide us, and did so splendidly. We told him we wanted firs and lots of them, plus plenty of water, and not many cattle, and he assured us he knew just the spot, 2 hours above his ranch. Imagine if you can how remote his ranch is -- 8 hours by burro or on foot, over rough mountain trails, from Talpa, which itself is 8 hours by truck from an all-weather road and another 3 hours from Guadalajara!

We left Talpa about 9:30 a. m., in a dense fog — we walked an hour to the southwest before it lifted and we could see our peak looming up. Another hour, and we reached Aranjués, a ranch at which we turned

northwest up the Río Charco Verde. The river-valley plants, here between 3800 and 4500 feet, are those of dry warm areas: guavas, Salix taxifolia ("taray"), Cestrums, Burseras, Opuntias, figs.

Along the Charco Verde we began seeing oaks and pines on the hills above us. In the valley itself, along the river, we found lots of Alnus, Salix, Fraxinus and, much to my surprise, Juglans, which I had not seen in Jalisco before.

At about 6000 feet we were in a fine pine-oak forest, with not much underbrush. The big pines are a meter or more thick, with tall straight boles. Most of them are heavily parasitized by a big shrubby mistletoe with bright scarlet flowers 2 inches long, a Psittacanthus.

Late in the afternoon of the 19th we reached the summit of the south ridge of the mountain, and dropped off steeply on the Pacific slopes into the fir forest. What a change in aspect! Here the big firs (Abies religiosa) are abundant, and all the trees and shrubs are covered with moss. Clouds came in soon after noon, every day we were there. Pines are abundant with the firs, and oaks, too, but most striking is the presence of various other deciduous trees which are absent on the drier east slopes: Cornus, Ostrya, Carpinus, Ilex, Prunus, Styrax. Farther down the barranca, near the water, there is a dense growth of smaller trees which nearly shades out all herbaceous growth except ferns. There is a big arborescent Clusia, a Saurauia, several Melastomaceae and Araliaceae, a good many shrubby Compositae, an Inga which is very common, and in all a most interesting assemblage.

We spent 2 whole days exploring the mountainsides, and finally quit because we ran out of newspaper and food. We had been living on tortillas and beans, anyway.

The whole area is one that needs a lot more exploration by naturalists. It is not far from the coast, of course, and one plan that might yield good results would be to fly into Talpa, hire pack-animals and go by mountain trail across the Sierra de Cuale to Puerto Vallarta on the coast, then fly out. There is good daily plane service all over this part of Jalisco.

We came back to Talpa on Saturday, the 22nd, and are on our way out to Guadalajara.

Continued, Guadalajara, Nov. 26

We came out, as promised, then went south to Autlán, which is a pleasant town 3000 feet above sea-level, in the hot valley inside the ring of coast-wise mountains. I had long wanted to cross the plains and river-valleys which lie between Autlán and Ciudad Guzmán, and yesterday we set off early to attempt the "crossing." Everyone in

Autlán assured us that we could reach El Grullo, El Limón, and Tonaya, but beyond that there probably were no roads. Actually just the reverse proved true -- there seems to be almost no traffic at all between the two largest towns in southern Jalisco (Autlán and C. Guzmán), but there is traffic from the middle to each end. The road from El Limón to Tonaya proved to be a mere track, often lost in cornfields, covered by cattle tracks, or washed out by floods. From Tonaya to Guzmán, however, it improved steadily. The vegetation is rather scanty all the way across (some 60 miles). There are lots of Acacias and Cassias, and cacti (Opuntia and Lemaireocereus) are abundant. Tree Ipomoeas are conspicuous on the hills, and in the valley thickets you find Casearia, Randia, Pisonia, and lots more thorny legumes. We were glad to get out of the hot lands and cross the pine-covered flank of the Nevado de Colima on our way to Guzmán.

We expect to finish our field work after one more long trip, and will send a final report then.

Best regards,

Rog

## VI. A summary of dates, localities and collections.

The field-work described in the above letters was abruptly terminated on November 25, when we returned to Guadalajara. Joe received word that his father was seriously ill in Philadelphia, and as a result of this he left Guadalajara by plane at 6 A.M., November 28. I completed the work of packing our specimens, left Guadalajara for the last time on the morning of December 11, and reached Ann Arbor about midnight, December 18. Following is a summary of the field-work of the entire expedition:

| Date | Locality | Collection-numbers | Comments |
|---|---|---|---|
| 6 Sept. | San Luis Potosí: 17 miles by road N.E. of C. del Maíz | 12770 - 12776 | Oak forest |
| | Jalisco: 2 miles S. of Ojuelos | 12777 - 12794 | Grassland |
| 7 Sept. | Jalisco: 11 miles S.E. of Lagos | 12795 - 12829 | |
| 10 Sept. | Jalisco: Nevado de Colima, N.E. slopes, 2900-3100 m. | 12830 - 12844, 12869 - 12889 | Fir forest |
| | Jalisco: Nevado de Colima, N.E. slopes, 3100-3300 m. | 12845 - 12868 | |
| 13 Sept. | Jalisco: as above | 12890 - 12904 | |

| Date | Locality | Collection-numbers | Comments |
|---|---|---|---|
| 14 Sept. | Jalisco: Nevado de Colima, N.E. slopes, 2000 - 2800 m. | 12918 - 12927 | |
| 16-17, 18-21, 22 Sept. | Jalisco: 3 miles south of Mazamitla, in pine forests, alt. 2100 m. | 12928 - 13010, 13026 - 13128, 13140 - 13171 | |
| 18, 21, 23 Sept. | Jalisco: 2 miles N.E. of Mazamitla, wet meadows | 13011 - 13025, 13129 - 13139, 13172 - 13195 | |
| 23 Sept. | Jalisco: 3 miles N.E. of Mazamitla, oak forests | 13196 - 13202 | |
| | Michoacán: West of Jiquilpan, dry canyons | 13203 - 13226 | |
| 24 Sept. | Michoacán: Grounds of Hotel Palmira, Jiquilpan | 13227 - 13229 | |
| 25 Sept. | Jalisco: 5 miles S.W. of Tamazula de Gordiano | 13231 - 13233 [No. 13230 not used] | |
| 28 Sept. | Jalisco: 11 miles S.E. of Lagos | 13234 - 13249 [Same loc. as nos. 12795 - 12829] | |
| 27 Sept. | Jalisco: 23 miles N.E. of Lagos | 13250 | |
| 29 Sept. | Jalisco: 11 miles W. of Arandas | 13251 - 13266 | Pastures |
| 30 Sept. | Jalisco: 2 miles N. of San Ignacio | 13267 | |
| | Jalisco: 3 miles N.W. of Capilla de Guadalupe | 13268 - 13272 | |
| | Jalisco: Barranca of Río Verde, road to Yahualica | 13273 - 13275 | |
| 1 Oct. | Jalisco: 2 miles S. of Santa Cruz de las Flores | 13276 | |
| 1-2 Oct. | Jalisco: Mountains near El Molino | 13277 - 13330 | |
| 4 Oct. | Nayarit: 10 miles E. of Jalcocotán | 13331 - 13361 | Pine forest |
| 5 Oct. | Nayarit: Between Tepic and Jalcocotán | 13362 | |
| | Nayarit: 4 miles east of Jalcocotán | 13363 - 13368 | |
| 6 Oct. | Nayarit: 20 miles S.E. of Tepic, in oak forests | 13369 - 13371 | |
| | Nayarit: 10 miles S.E. of Tepic, in ungrazed grassland | 13372 - 13395 | |

| Date | Locality | Collection-numbers | Comments |
|---|---|---|---|
| 10 Oct. | Jalisco: Nevado de Colima, N.E. slopes, 2800 m. | 13396 - 13424 | |
| 11-13 Oct. | Jalisco: Nevado de Colima, N.E. slopes, 2250-2550 m. | 13425 - 13508 | Pine zone |
| 15-16 Oct. | Jalisco: Nevado de Colima, N. ridge west of divide, 2100-2200 m. | 13509 - 13572 | Pine forest |
| 17 Oct. | Jalisco: Nevado de Colima, N.E. slopes, upper cornfield zone, 2000-2250 m. | 13573 - 13588 | |
| 18 Oct. | Jalisco: 3 miles S. of Mazamitla | 13589 - 13615 | [Same loc. as 12928 et seq.] |
| 19 Oct. | Jalisco: Mts. near El Molino | 13616 - 13629 | [Same loc. as nos. 13277 - 13330] |
| 21 Oct. | Jalisco: 6 miles N.W. of Cuautla | 13630 - 13677 | Oak forest |
| 23-25 Oct. | Jalisco: 7 miles W. of Los Volcanes, in Sierra de la Campana, 1900-2000 m. | 13678 - 13804 | Pine forest |
| 30 Oct. | Jalisco: Nevado de Colima, 4000-4340 m. | 13805 - 13820 | |
| 31 Oct. | Jalisco: Nevado de Colima, N.E. slopes, 2900-3100 m. | 13821 - 13824 | |
| | Jalisco: Nevado de Colima, N.E. slopes, 2250-2550 m. | 13825 - 13826 | |
| 2 Nov. | Jalisco: Sierra de Manantlán, near Aserradero El Cuartón, 2500 m. | 13827 - 13866 | Pine forest |
| 4-5 Nov. | Jalisco: Sierra de Manantlán, 2 miles from Aserradero S. Miguel I, 2250-2400 m. | 13867 - 13923 | Cloud forest |
| 6 Nov. | Jalisco: Sierra de Manantlán, bajada between S. Miguel I and Durazno, 2000-2350 m., cloud forest | 13924 - 13952 | |
| 7 Nov. | Jalisco: Sierra de Manantlán, bajada between S. Miguel I and Durazno, 1700 m., pine forest | 13953 - 13992 | |
| | Jalisco: Sierra de Manantlán, bajada between S. Miguel I and Durazno, 1700 m.; barranca in pine forest area | 13993 - 14018 | |

| Date | Locality | Collection-numbers | Comments |
|---|---|---|---|
| 12-13 Nov. | Jalisco: near Santa Mónica, 1950-2050 m. | 14019 - 14135 | Fir forest |
| | Jalisco: Between Santa Mónica and Agua Blanca, 2200-2350 m. | 14136 - 14146 | |
| 14 Nov. | Jalisco: Between Agua Blanca and S. Miguel de la Sierra, 2000-2250 m. | 14147 - 14174 | |
| 16 Nov. | Jalisco: 9-10 miles S.W. of Autlán, 1300-1600 m. | 14175 - 14233 | Oak forest |
| 18 Nov. | Jalisco: Mountains N.E. of Talpa de Allende, 1250-1500 m. | 14234 - 14235, 14237 | |
| | Jalisco: 4 miles S. of Mascota | 14236 | |
| 19-21 Nov. | Jalisco: Sierra de Cuale, S.W. of Talpa de Allende, fir zone, 1800-2250 m. | 14238 - 14326, 14351 - 14402 | |
| 22 Nov. | Jalisco: Río de Talpa, at Talpa | 14327 - 14328 | |
| | Jalisco: 4-5 km. S.W. of Talpa, road to Aranjués | 14329 | |
| | Jalisco: S.W. of Talpa, valley of Río Charco Verde, 1400-1800 m. | 14330-14350 | |
| 23 Nov. | Jalisco: Mountains N.E. of Talpa, 1500 m. | 14403 | |
| | Jalisco: 7 miles W. of Los Volcanes, in Sierra de la Campana, 1900-2000 m. | [Same loc. as 13678 - 13804]<br>14404 - 14406 | |
| 25 Nov. | Jalisco: Nevado de Colima, N.W. slopes near Jazmín, 1500 m. | 14407 | |
| 7 Dec. | Jalisco: 6-7 miles S.W. of Villa Corona | 14408 - 14415 | At springs |
| | Jalisco: Guadalajara, in cultivation | 14416 - 14417 | |

NEW BOOKS BRIEFLY NOTED. -- Gleason's long-awaited "Illustrated Flora". For a reference work on the vascular plants of eastern North America, the most important in recent years is the "New Britton & Brown" on which Dr. Gleason has been working since 1939. For more than 50 years the "Illustrated Flora" has been with "Gray's Manual" a necessity on the library shelf of every botanist. Now Dr. Gleason brings us really a new work, completely re-written and with new and superior illustrations, and modern concepts of species and their relationships. We see no objection to the book unless it be the price, which is listed at $30 for the three volumes. We hope to give our readers a more comprehensive review of this important work in the next issue of the Asa Gray Bulletin:

The New Britton and Brown ILLUSTRATED FLORA of the Northeastern United States and adjacent Canada, by Henry A. Gleason. Vol. 1, Pteridophyta, Gymnospermae, Monocotyledoneae. lxxv, 482 pp. Vol. 2, Choripetalous Dicotyledoneae. iv, 655 pp. Vol. 3, Sympetalous Dicotyledoneae. iii, 589 pp. Published by the New York Botanical Garden. Copyright 1952.

A New Illustrated Flora of West Virginia. As the authors state in their preface, this is the first fascicle, comprising one-third or one-fourth of a proposed treatise of the vascular plants of the State of West Virginia. More important than this, it represents the results of the authors' work for a period extending over more than 25 years. This first published part of the flora is one of the series of useful illustrated botanical bulletins which have been issued by West Virginia University. Every species is illustrated by a line drawing, and most of the species are quite recognizable from the drawings. The authors have incorporated into the flora, in addition to the usual information about distribution of each species in the State, a host of references to recent literature. The new flora, when completed, should be a useful guide to anyone who is interested in the botany of the northeastern United States, including Michigan, which has many species in common with the more southern, but also more elevated, West Virginia:

Flora of West Virginia (Part I), by P. D. Strausbaugh and Earl L. Core. [Pteridophyta, Gymnospermae, Monocotyledoneae]. 273 pp. West Virginia University Bulletin, Series 52, No. 12-2, June 1952.

The Vegetation of Chiapas. This is a landmark in the history of the botany of Mexico, because it represents the first detailed modern study of the vegetation of any of the States of Mexico. The State of Chiapas, lying as it does adjacent to Guatemala and below the Isthmus of Tehuantepec, is in a particularly strategic position, so that a thorough knowledge of its flora and vegetation is essential to our better understanding of the relationships between the Central American floras and those of Mexico. Dr. Miranda, during his relatively short residence in Chiapas, has accomplished a great task merely in familiarizing himself with all the very diverse elements of the flora of the state,

and summarizing them in convenient form. He divides the state into 8 floristic regions, and describes each at some length. Most interesting to this reviewer is the great similarity between the flora of Chiapas and that of Veracruz, and the relatively lesser similarity between Chiapas and the states of the Pacific side of Mexico. A major part of the completed work (of which this is Part 1) will be lists of the plants of Chiapas, arranged alphabetically according to their common names, together with notes on their utility; the present volume contains 160 pages of this list, comprising perhaps one-fourth of the alphabet (A - CH). A second volume will presumably complete this list and will contain an alphabetical list of scientific names of the species, and a bibliography:

La Vegetación de Chiapas. Primera Parte, by Faustino Miranda. 334 pp. Seccion Autográfica, Departamento de Prensa y Turismo, Tuxtla Gutiérrez, Chiapas, Mexico, 1952.

Ferns of Michigan. This is a companion volume, similar in size, format and inspiration to Billington's popular "Shrubs of Michigan", and like that volume it reflects the combination of scholarship and humanity that made Cecil Billington beloved. In the years before his death he spent uncounted hours assembling data on ferns and their uses, the meanings of their common and scientific names, their taxonomy, and their distribution in Michigan. He begrudged no effort to make this account of the ferns of his home state interesting and readable as well as scientifically valuable. In these aims he was eminently successful, and the work of Cain and Hagenah and others, after his death, has not changed the Billington flavor of the book but has perhaps intensified it while adding certain details that will make it still more useful.

I enjoyed the introduction to this little volume quite as much as any other part; is it not fascinating to read little bits of information like this: "The [coiled] fronds are essentially complete in the bud, and their development to full size is mainly a process of unrolling and enlarging. Regardless of ultimate size or shape they all start out in this manner. And so thoroughly is this plan followed that not only are the fronds as a whole coiled, but each of the remotest divisions is rolled toward the next larger one and so on all down the line"? Likewise which one of us realizes that a fern leaf puts forth at maturity millions of spores which may ultimately produce new generations of ferns? Perhaps we all know these things vaguely, but here they are in so many words. Did you know that ferns grow above the Arctic Circle? That some species are edible? That the fibrous roots of some are used as a medium upon which to grow orchids? That Moonwort would unlock a house door if gathered at the right time? That some kinds may be readily grown in gardens, whereas others require special care and conditions? Do you know how to make a herbarium

specimen of a fern, for permanent reference? Can you identify an unknown species?

The technical part of the book, that designed for the study, identification and analysis of the nearly 80 species known or reported from the state, has several useful features. It is preceded by a pictorial glossary, alphabetically arranged, which was specially drawn with the Pteridophyta in mind, so that even such ordinary botanical terms as "linear" are illustrated by structures chosen from among the ferns or fern allies. There is also a more complete, printed glossary at the end of the text, so the novice need have no fear of becoming entangled in new technical terms.

In my opinion the feature of the book which will be of least value is the inclusion of various minor forms and varieties under many of the species. Under the first species in the book, for example, Equisetum arvense, one paragraph is devoted to brief discussion of the following minor forms: nemorosum, varium, campestre, ramulosum, pseudosilvaticum, and diffusum. Unfortunately, distinct as these seem on paper, they can be properly distinguished (if at all) only in a large herbarium where there are ample series of specimens for comparison; their inclusion in a work designed especially for the "layman and the nature lover" seems out of place, and may lead to confusion and faulty concepts of plant-species in the very group of people who are most interested in knowing plants as they really are.

This debatable fault is more than balanced by the maps which indicate the known distribution of each species within the state. When these maps are considered in conjunction with those in the "Shrubs of Michigan" and in other comprehensive papers like F. J. Hermann's "The Genus Carex in Michigan", there begins to emerge a series of patterns of distribution which must be characteristic of all the plants in the state. We need more maps of this kind, resulting from intelligent field work and comprehensive search in literature and herbaria for Michigan plant-records.

Ferns have always fascinated mankind, and the study of ferns has long been popular, so that in many parts of the world popular or semi-popular accounts of these plants are published before much attention has been given to other groups of plants which are equally interesting from the technical standpoint but far less interesting to the non-specialist. It is to be hoped that the publication of Mr. Billington's excellent little book on the ferns of Michigan will stimulate the study of other groups of plants in the same area, until the flora of the whole state becomes adequately known.

Ferns of Michigan, by Cecil Billington. vii, 240 pp. Cranbrook Institute of Science, Bulletin No. 32, 1952.

— R. McV.

# "THE BARRANCA OF GUADALAJARA" AND ITS PLACE IN BOTANICAL LITERATURE

Rogers McVaugh

THE literature of systematic botany is replete with references to specimens collected in "the barranca" near Guadalajara, Jalisco, Mexico. Perhaps because "barranca" has no exact equivalent in English, it is an unfamiliar term in the United States, and botanists in that country and in Europe have sometimes mistaken "la barranca" for "La Barranca"; that is, they have supposed the word to apply to a definite locality or settlement, without understanding that it is a physiographic term akin to "cañon", "arroyo", "gully", "draw" and others.

The first widely distributed plant collections made in the vicinity of Guadalajara were those of the French botanist Henri Galeotti, who visited Jalisco in 1836 and again in 1837, and collected a few botanical specimens in what he called "la grande Barranca de Guadalaxara". Apparently Galeotti's specimens are among the first botanical materials from Jalisco to have found their way into the herbaria of the world, although the British ship "Blossom", under the command of Captain F. W. Beechey, had lain in the harbor of San Blas for some months during the winter of 1827-1828, and the naturalists of the ship had made important collections near Tepic, and between Tepic and San Blas.

Fifty years after Galeotti's first visit, in the summer of 1886, the well known botanical collector, Dr. Edward Palmer, spent several months in the vicinity of the city of Guadalajara, and the results of his work were published in 1887 by Sereno Watson[1]. Unfortunately neither Watson nor Palmer appreciated the importance of providing precise locality data for Palmer's plants, so that the localities in Watson's list, by modern standards, are somewhat vaguely described. Throughout the list, for example, Watson used the name "Barranca" exactly as if it were the name of a settlement or city, like Guadalajara, Río Blanco, Chapala, and Tequila, which Palmer also visited.

Of the approximately 675 collections which Palmer secured in Jalisco, about one-sixth proved to be new to science. The richness of the flora apparently attracted the attention of that other indefatigable Mexican collector, Cyrus Guernsey Pringle, for in 1888 Pringle visited Guadalajara and spent 48 days in the vicinity.

Enthused by the great variety of plants which he found, particularly

[1] List of Plants collected by Dr. Edward Palmer in the State of Jalisco, Mexico, in 1886. Proc. Amer. Acad. 22: 396-465. 1887.

in the great barranca of the Río Grande, Pringle returned again and again to Jalisco; he made in all more than 20 visits, in 15 different years from 1888 to 1908. His visits are described in his published journal (Life and work of Cyrus Guernsey Pringle, University of Vermont, 1936). Most of Pringle's time in Jalisco was spent near Guadalajara, particularly on the slopes of the barranca. He himself wrcte:

> "As I have descended into this barranca almost daily for weeks of several different seasons, and have searched about its cliffs of various exposures, clambered over its dizzy slopes, or crowded through its thickets, it has seemed that the number of plants which it holds must be inexhaustible." (Garden and Forest 7: 152-153. 1894)

Palmer's plant-specimens, and those of Pringle, have been widely distributed to the principal museums of the world (it was Pringle's practice to collect 60 examples of each species of plant from a given locality, wherever possible). Many botanical authors of the last 60 years have cited specimens collected by Palmer, or Pringle, or others, "near Guadalajara", or "in the barranca near Guadalajara". Sometimes the locality is cited simply as "Barranca, Jalisco", or even as "Baranca", for the word was so spelled on the printed labels distributed with Palmer's collections. It seems that non-Spanish-speaking botanists, in particular, have come to think of "Barranca" as a locality somewhere near Guadalajara, without understanding the meaning of the term.

In American Spanish the word barranca means, as nearly as one can translate it into English, "a deep gorge eroded by a stream". It is almost equivalent to cañon (or canyon) as understood in the southwestern United States. The many deep ravines and gorges of the Pacific slopes in southwestern Mexico are commonly called barrancas, and of all these perhaps the most noted is the great barranca of the Río Grande de Santiago. The longest river in Mexico is the Lerma-Santiago, which rises near Toluca (where it is called the Lerma) and flows generally west into Lake Chapala. As it flows out of Lake Chapala again, this time toward the north and northwest, it is called the Río Santiago or Río Grande.

At the falls of Juanacatlán, some 20 kilometers southeast of Guadalajara, the river begins its descent to the Pacific Ocean with a single fall of 20 meters. At Puente Grande, which the traveler crosses on the paved highway to San Luis Potosí (about 7 kilometers north of Juanacatlán), the river is still on the level of the plateau, at an elevation of a little less than 1500 meters. Just north of the bridge, however, it falls off rapidly into a great system of gorges 500 to 600 meters deep and more than 250 kilometers long.

The city of Guadalajara lies on the table-land, at an elevation of 1545 meters, distant at the nearest point no more than 8 kilometers

from the edge of the barranca. One can walk, or drive in an automobile, to a point overlooking the river, where the precipitous walls abruptly fall away. What is not generally realized by foreigners, however, is that the people who live in the area do not think of the gorge as one barranca, but as a whole series of them, each with its own local name. There is no "Barranca of Guadalajara", so-called. Tributary barrancas take their names from settlements or other places at their heads or along their courses; along the main river individual stretches take the names of nearby villages. Beginning below Puente Grande, for example, and continuing past Guadalajara, the Río Santiago passes through the Barrancas of Colimilla, Oblatos, Huentitán (here, near the junction with the Río Verde, is located the power plant called Las Juntas), Ibarra, and La Experiencia. A little farther downriver enters the barranca of Río Blanco, and still farther down are the barrancas of Escalón, San Cristóbal, and Tequila.

To return to the subject of botanical collections in the barrancas (I shall use the plural form in its proper place henceforth), it is difficult at this late date to determine the exact locations at which Palmer and Pringle and others collected many years ago. One can reach certain conclusions, however, from study of published material, and these are set forth below in the interest of future students of Mexican botany.

Palmer's locality which Watson called "Barranca" seems relatively easy to locate. Watson's published account, cited above, describes it as follows:

> "A cañon nine miles east by north from Guadalajara, with towering rocky sides, where is the hacienda of Senor Portillo, and a ferry over the Rio Grande known as the Paso de Ybarra".

W. E. Safford, in an unpublished manuscript account of Palmer's travels, says that Palmer reached the barranca by crossing level fields from Buena Vista on the northern edge of Guadalajara. Palmer was notoriously inaccurate in recording compass directions, and in this case it seems probable that his direction from the city was north by east rather than east by north. The Garita de Buena Vista was in Palmer's time a toll-gate or tax-station at the north-eastern edge of the city, approximately at the present northern end of the Calzada de Independencia. Here began the cart-road to Huentitán, which continued down into the barranca and crossed the river. This was a heavily travelled road, the old highway to Aguascalientes. The road from the city toward Huentitán angled toward the northeast, but ultimately it turned toward the north, and the so-called Barranca de Ibarra lies but a little east of north from the city, below the junction of Río Grande and Río Verde, and extending down to about where the Barranca de Experiencia joins the main gorge. In modern times, during periods of high water, the river is crossed in the Barranca de Ibarra

by a bridge (the Puente de Arcediano). Presumably Palmer travelled from the city by way of Huentitán, thence down into the barranca to the Hacienda of Señor Portillo of which Watson writes. Ing. Ricardo Lancaster-Jones, of Guadalajara , kindly informs me that this hacienda, the holding of Sr. Don Juan Nepamuceno Portillo, was in fact not far below the bridge.

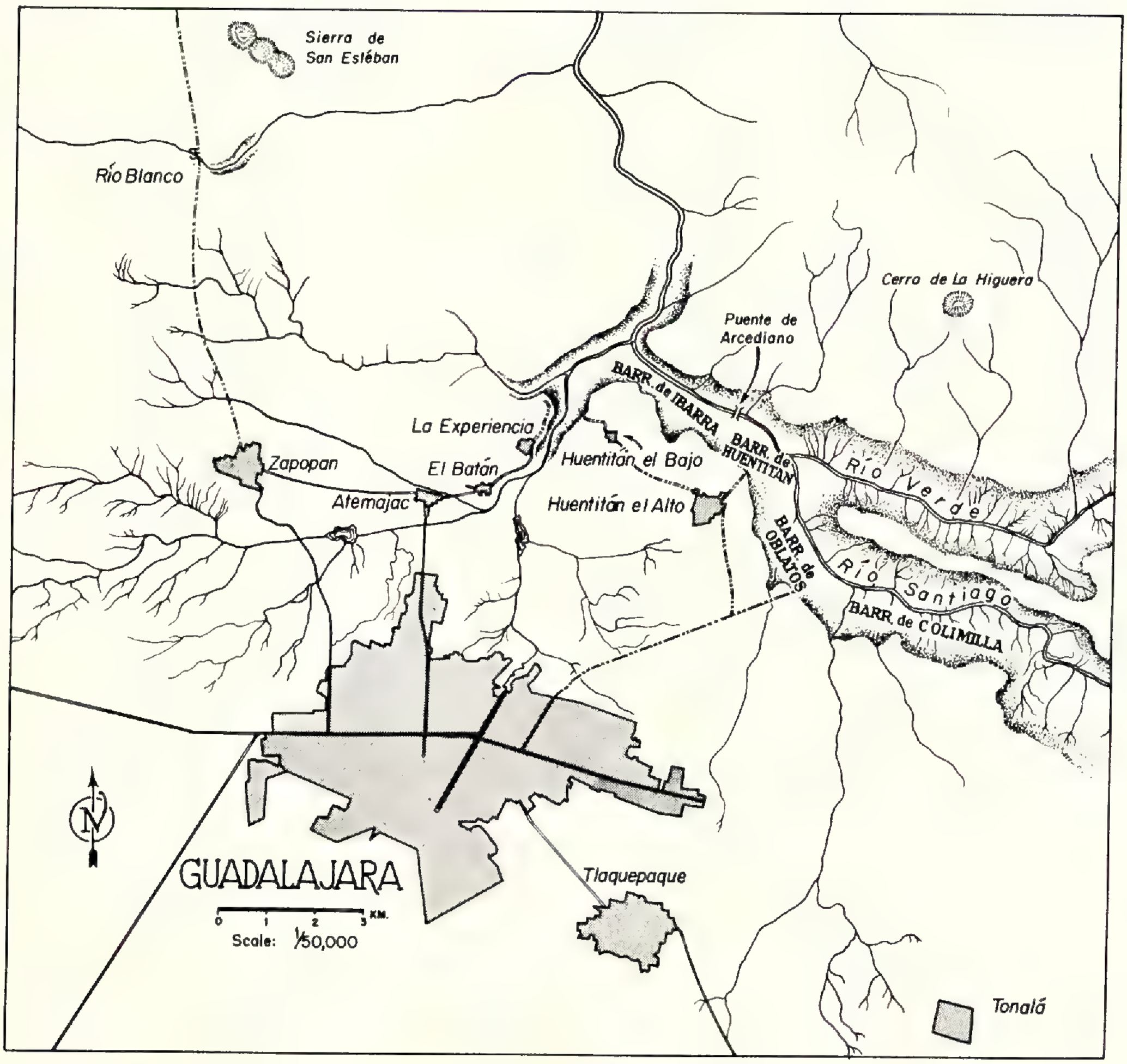
Pringle's collecting-grounds in the barrancas are not so easily located, since he habitually covered more ground than Palmer. Palmer (if we may judge by what is known of his activities in other years) probably spent a week (actually June 16-23) at the Hacienda de Portillo, collecting everything he found that would make a specimen, including weeds, and species of which he saw no more than one depauperate plant. Pringle, on the other hand, ranged rather widely on foot, looking for interesting species which were growing in sufficient abundance for him to collect in sets of 60. This is not to say that Pringle neglected the rarer species entirely, but his methods of collecting made it necessary for him to explore rather widely every day in order to fill out at least a few of his series of specimens for sale. Beside this, Pringle revisited the area repeatedly, and it is safe to say that no real generalizations can be made about what "Barranca" means on one of Pringle's labels, except that the specimen came from somewhere between Puente Grande and Río Blanco.

Pringle had, however, certain favored collecting areas to which he returned day after day. His habit was to make his headquarters in a hotel in Guadalajara, and to go out on foot every day, with his assistant, to bring in specimens which he pressed and dried in the hotel (often on the flat roof, as recorded in his diary). In 1888, on the occasion of his first visit to Jalisco, for example, his diaries contain such entries as the following:

October 31. I return to the barranca . . .
November 3. Earle and I go again to the barranca . . .
November 15. Going out two or three miles on the road to the barranca . . .
November 28. I go late to the barranca below the verge of the mesa directly above the hacienda.
December 1. I go to the barranca and . . . descend to the river.
December 4. I go by street car to Atemajac and thence walk some four miles to the heights overhanging the barranca.
December 12. I go northward to the vicinity of Esperanza.
December 13. George and I went to Rio Blanco.

One may infer that Pringle usually went out the same way to the barranca, i.e. generally north, by the usual roads, which would enable him to walk a part or all of the way to the river, and return to the city the same day. The same pattern is repeated in later years: his

favorite collecting spots were in the barrancas north of the city, areas which he reached from Río Blanco, from "Esperanza", from Atemajac, and from the "road to the barranca", i.e. perhaps from Huentitán. In later years he made many visits to Río Blanco and to Atemajac. Occasionally he mentioned the Barranca de Ibarra, but apparently his diaries contain no references to the Barrancas of Huentitán and Oblatos, and it may be that his collecting never took him that far up the river. Pringle's locality "Esperanza" seems to deserve special mention. I have inquired repeatedly in Guadalajara about a place of this name, presumably located north of the city, either near the edge of the barrancas or somewhere within them. Apparently Esperanza does not exist and, judging from the ordinary longevity of Mexican place-names, it did not exist in Pringle's time. There is, however, a small mill-town called La Experiencia in the correct position near the edge of the gorge (see map), and Pringle referred at least once to the "barranca below the factory of Experienza", so I suppose that his "Esperanza" is no more than a mis-spelling of "Experiencia".



Specialists have available to them more specimens from these barrancas north of Guadalajara than from almost any area of similar size in Mexico, chiefly because of the work of Palmer and Pringle. More than 700 species of plants were added to the known flora of Jalisco by the work of these two men alone, and a majority of these species came from a limited area between Río Blanco and the Barranca de Ibarra. As Pringle wrote years ago, the number of plants which the barranca systems hold seems to be inexhaustible, but future workers should attempt to explore the less accessible areas which are now almost unknown biologically.

Two Volumes on Orchids. Those who know Correll's "Native Orchids of North America, north of Mexico", will be interested also in his new "Orchids of Guatemala" the first half of which was recently published as a part of the Chicago Museum's Flora of that country. The book is copiously illustrated with drawings, most of which were made available by the late Oakes Ames, who is listed on the title-page as co-author. Like the other published parts of the "Flora of Guatemala", this one is notable for its complete keys to genera and species, detailed descriptions of each species and comprehensive notes on the occurrence of each in Guatemala. The orchids occupy a unique place among flowering-plant families because the tropical representatives of the group are of interest to many people, other than professional botanists, in temperate regions. The present account will no doubt be welcomed by those who are interested in orchid cultivation, as well as by their botanically-minded colleagues:

Orchids of Guatemala [Part 1], by Oakes Ames and Donovan Stewart Correll. [Genera Cypripedium to Epidendrum]. xiii, 395 pp. Published by the Chicago Natural History Museum (Fieldiana: Botany Vol. 26, No. 1), August 29, 1952.

The gap between the "Orchids of Guatemala", and the "Native Orchids of North America, north of Mexico", is very competently filled for the professional botanist by Williams' serially published "Orchidaceae of Mexico". The author's foreword states that the account does not pretend to be more than "a list of the species of Mexican orchids with their synonyms; a description of each of the genera . . ., and a key to those species now known in Mexico". Actually it is far more than this, for it is the result of Dr. Williams' interest in the Mexican orchid-flora over more than a decade, and in it he has assembled all the basic information necessary for further work on this large and complex group of plants:

The Orchidaceae of Mexico, by Louis O. Williams. Ceiba, volume 2 321, [xxiii] pp. Published by The Escuela Agrícola Panamericana, Tegucigalpa, Honduras, 1951.

# CAVES OF ORIENTE AND A TRIP WITH DR. EKMAN TO PICO CRISTAL*

John A. Nystrom, Bayamo, Cuba

NOT too many years ago, I walked a lot through the Cuban forests and especially in those found in the province of Oriente, to enjoy the marvels seen in the formation of hills and caves, fancies of nature which abound more in the Sierra Maestra than in the other mountain ranges. The lower ridges of the Sierra Maestra are of limestone and with time many natural caves have formed. From the ceilings stalactites of all sizes and colors have developed by the dripping waters. Sometimes their appearances are grotesque and sometimes fanciful.

At Santa Barbara de Guisa (Oriente) there are two caverns. At Baire there is a very large one and in other places there are many of great size and small. The cave of Mijial in the Sierra Maestra is to me one of the most interesting ones. There the first printing press of "Free Cuba" was established. The press was moved later to a cave along the cliffs of the Barajagua River. This cave is about 75 feet above the level of the river and appears like a hole in a wall. One can enter the cave through the rear, but that is far to climb. During the war for independence, Cubans reached it by ropes. When the Spaniards found the cave, they destroyed the press and, throwing out all the machines and materials, put an end to it. Even today you can still find around that place, pieces of metal which belonged to the press.

Between the Rivers Canapu and Manaca, there is a hill which has

*In August, 1951, I was fortunate to meet John Nystrom, who as a Swedish settler at Bayate (near Central Miranda in Oriente, Cuba) was one of Dr. E. L. Ekman's first acquaintances in eastern Cuba. Later the two explored much of the Sierra de Nipe, Sierra del Cristal and the western portion of the Sierra Maestra. The two were the first to climb Cuba's highest peak, Pico Turquino. With John Nystrom as guide, I was able to visit the pinelands at Pinares de Corojo, south of Bayamo near the intersection of the Río Oro and the Río Bayamo. Despite his age Nystrom proved to be a spry and able guide and put me to shame as we climbed the rugged trail up to the Pinares. Apparently, except for visits made to this area by Nystrom, no other botanist had visited these pinelands since Ekman collected there with Nystrom in 1915.

During our trip Nystrom regaled me with stories of Ekman's exploits and promised to send me a paper he had written about the ascent that he and Ekman made of Pico Cristal. Apparently this is the only botanical trip that has ever been made to the heights of Cristal. The following paper was originally written in Spanish by Mr. Nystrom and was translated into English by César Piña, a student of botany at the University of Michigan. -- R. N. Jervis.

the appearance of a three-story house. The cave entrance is high and almost invisible from below. It is difficult to enter because it is so narrow. Inside at the left there is what you could consider the kitchen and you can still see the effects of smoke. There are painted figures on the wall. To the right is a narrow room, then another larger room and below it a third, forming, as I said before, three stories. I have explored these caves extensively. In order to pass through the narrow openings I have had to crawl on my stomach to find where the early Indian inhabitants obtained their water. After a long search we found an entrance from the Manaca River.

On the coast of Sabana there is a cavern named "cave of dances". At the entrance is a very large room which was used for dances and farther on are several smaller ones.

At Imias an Indian village existed for a long time. The Indians probably carried on trade with those of Haiti. At Imias the remains of six or seven generations have been uncovered by excavations. There new fireplaces were found built over old ones.

Along the tributaries of the Río Mayarí Colorado there are several caves on the headwaters of the Rivers Nipe, Manaca and Canapu. But they are small, though still interesting because many Cubans lived in them during the War for Independence and during the Chambelona (Revolution of 1917).

In the Río Viran, there is another natural wonder, the natural bridge of Bidicerí (Bitirí). Along this river there are also several caves and waterfalls.

In these explorations, climbing hills, entering the caves, visiting waterfalls, life is really cheap. Lights can go out deep in the caves with so many labyrinths that one can be lost inside without outside help. In the hills where there are loose stones and rotten rock, one might say you walk on air, for a moment of carelessness, a misstep, and it's from there to eternity.

In the Pinalito of the Sierra de Nipe, the Río Piedra passes three times through a hill, forming two dry caves and another one through which the river passes today, coming out 200 feet lower and a kilometer from its entrance. At the divide of the rivers, Jagua to the south and Mayarí to the north, we found the Río Frío passing through a limestone hill. My companion of expeditions and adventures of this type, the Swedish botanist, Dr. Erik Ekman, swam under the hill for more than two kilometers with a candle stuck on a piece of Spanish cedar, coming out of this without any mishaps. Months later he tried it again with another companion, but his companion got scared as soon as he lost sight of daylight, and turned back. In the exit on the other side there is a waterfall 25 feet high which could serve for a hydraulic plant, but in dry weather there is only a small current.

Loma Cristal in the Sierra de Tánamo (also known as Sierra del Cristal) is well-known. A trail passes between Mayarí Abajo and Mayarí Arriba for about 12 leagues, extremely bad for travel, but very interesting. Dr. Erik Ekman and I, with two other companions, decided to climb Cristal and travelled from Alto Songo to Mayarí. We passed later through the hills of Mica and Nicaro, visiting the Moruru mine where it is said that there is gold. This may be true, although only mica has been found so far. We continued on our way to the ford in the Río Levisa whose waters come from Loma Cristal. We left our two companions there to watch the horses and supplies, while Dr. Ekman and I started out very early in the morning to climb where nobody else had climbed before. Just as we reached the point where we were going to start our climb, a tremendous rainstorm began and naturally it was a little chilly. We decided to leave our papers and other things under a palm leaf and go on without them for it was necessary to climb without anything to impede our ascent. The water ran like a river over the trail which we travelled until we were 1125 feet above the level of our camp. With machetes in hand we climbed until the cold wouldn't let us go any more. We were so numb that we could hardly walk, could hardly even move. We knew that we were near the top, but it was around three in the afternoon and we had to return to camp since we could not sleep where we were, because of the intensity of the cold. We started to descend and when we least expected it, we slipped and fell over the wet rocks. I don't know why we did not break arms or legs for we took several dangerous falls. Just after darkness came, I broke my camera with its roll of film. We reached the bottom at nine o'clock at night.

Now the worst part was finding the camp where our companions were. We reached the banks of the stream in complete darkness and, remembering our revolvers, fired into the air. In a little while we heard answering shots and thus we found camp. Once in camp we had to take our clothes off to dry them before we ate or slept. A day and a night like this can never be forgotten.

The next day we explored the base of the Loma de Cristal while our two companions remained in camp to watch our horses. In the afternoon we found a branch of the Río Levisa along which we found a sight which left us astonished. Were we dreaming? Or was it a miracle before our eyes? The water was running in clear pools over a bottom of gold, gold that shone so that we thought its splendor would drive us crazy. Upon close investigation we decided that what had left us open-mouthed was only mica, eroded out of the rocks by the rushing waters. When we touched the mica, it crumbled like ashes. But for a moment it was for us a magnificent dream — a dream never forgotten — the golden dream!

When we thought that it was time to look for a proper place to sleep and eat, Dr. Ekman and I chose a cave-like opening formed by a large

block of rock and here we built a fire for warmth and to cook our food. After eating, we slept. In the morning when we woke, we had another surprise. It must have been about six o'clock and the rays of the sun fell against the base of the hill, glittering in a most extraordinary manner. When we looked for the cause of all this unexpected brilliance, we saw a place where a block of the hillside above us had fallen off and everything below us was as white as paper. All the hillside was this way; everything looked like glass! With the sun's rays shining over this you can imagine the beautiful view we had — a view I never expect to see again and we did not have a camera to record it! Everything looked like diamonds, "el dorado" for which the early Spaniards searched so much. When we returned to camp, we rested, but we were still thinking about trying to climb the peak of Cristal the next morning.

The next morning we started to climb again over the same trail we had taken before, but this time we had a beautiful day with bright sunshine. We were able to see perfectly a long distance. We reached the top a little after mid-day and much to our amazement we noted that if we had climbed 75 feet more the other time, we would have reached the top. Because it was so dark and the rain was so abundant on the first attempt, we did not realize that we were so high. This time, though, we were able to see the ocean north of Antilla; to the west lay the Sierra de Mayarí; to the northwest was Preston and its fertile cane fields.

The vegetation on the peak was composed almost entirely of shrubs and a type of pine which was unknown before. The pine trees were low and small, — midgets. [The only pines from Cristal that are in Ekman collections seem to be the same as those from Nipe and Gran Piedra. If this dwarf pine was different and Ekman did make a collection, which he certainly must have, the collection may have been among his things that were burned in the revolution of 1917. — R.N.J.] Several kinds of plants known in this type of soil were common. There are many springs on Loma Cristal and because of them Río Levisa has so much water for its short course.

In general everybody believes that in the tropics the mountains are easier to climb than in colder regions, but those that think so are wrong! In the tropics rain is abundant at high regions and with few exceptions these rains come daily. Naturally there is more vegetation among the trees and this vegetation (ferns, shrubs, fungi, and mosses) is a great nuisance for the hiker. After any shower the streams rise and can't be crossed for a long time, sometimes for hours or even days, until the waters go down to normal levels.

# LIST OF SUBSCRIBERS TO ASA GRAY BULLETIN, NEW SERIES, VOLUME I

As we promised in the July issue, we are publishing in the present number the names and addresses of those who have subscribed to the first volume of the Asa Gray Bulletin. We hope that this list will serve as a useful aid to communication among persons who have similar interests. We have indicated, as far as we knew the personal preferences of individuals, any memberships in the sponsoring organizations. These memberships are indicated as follows: Gray Memorial Botanical Association (GMBA), Michigan Botanical Gardens Association (BGA) and Michigan Botanical Club (MBC). We shall welcome suggestions for the improvement of the listings.

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# INDEXES

NOTE. To facilitate use of the Index, items have been classified into (I) a General Index, (II) an Index to Persons, (III) a Geographical Index, and (IV) an Index to Scientific Names. Vernacular names have not been indexed, since they are not likely to be looked up except by those who know the Latin equivalents. Names of specific geographical localities and less well-known subdivisions should be sought under the names of more comprehensive regions. Names of persons only incidentally mentioned are not entered. In compiling the indexes much aid has been given by Mr. and Mrs. T. P. Bank II.

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